Tennessee Viral Hepatitis Epidemiological Profile 2017

Tennessee Department of Health, Viral Hepatitis Program | January 2019

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Executive Summary

This report presents 2017 surveillance data for Viral Hepatitis (VH) in Tennessee (TN). The report focuses on reported cases of acute hepatitis B virus (HBV), acute hepatitis C virus (HCV), and chronic HCV in the state.

The TN Department of Health's (TDH) VH Program manages the VH cases within the TDH surveillance registry. Acute HBV, acute HCV, and chronic HCV are reportable conditions. Demographic information, vital status, transmission risk, and laboratory results are collected on standardized case report forms and laboratory reports. This data is then stored in the National Electronic Disease Surveillance System (NEDSS) Based System (NBS) and used to create yearly epidemiological reports.

The data reported are for 2013 through 2017 and all data are based on information received by TDH as of August 1, 2018.

Background

- From 2006 to 2013, the rate of acute HBV infection in the United States (U.S.) remained stable; however, TN and two other Appalachian states demonstrated a 114% increase in acute HBV cases. This increase, in the Central Appalachia region, occurred after 2009 and was most pronounced among whites, aged 30–39 years, and who reported injection drug use.[1]
- TN has one of the highest reported case rates of acute HCV infection in the nation and case rates continue to rise. TN (along with three other states in the Central Appalachia region) demonstrated a 364% increase in reported acute HCV cases from 2006 to 2012 among individuals aged 30 years and younger.[2]
- Given that more than 70% of acute HCV cases are asymptomatic, it is likely that some newly reported cases of chronic HCV (particularly among younger individuals) represent recently acquired or even acute HCV infection.

Key Findings

Hepatitis B Virus

- From 2013 to 2017, there was a **41% increase in reported acute HBV cases in TN**.
- Other notable findings among HBV cases reported from 2013 – 2017 include:
    - Men accounted for 59% of acute HBV cases;
    - Individuals age 30 years and older accounted for 90% of acute HBV cases; and
    - From 2013 to 2017, **rates of acute HBV**:
        - Decreased 43% among individuals less than 30 years,
        - Increased 16% among individuals aged 30 – 44 years, and
        - **Increased 100% among individuals aged 45 and older**.

[1] Harris AM, Iqbal K, Schillie S, et. al. Increases in Acute Hepatitis B Virus Infections – Kentucky, Tennessee, and West Virginia, 2006-2013. MMWR Morb Mortal Wkly Rep. 2016; 65(3): 47-50.

[2] Zibbell JE, Iqbal K, Patel RC, et al. Increases in hepatitis C virus infection related to injection drug use among persons aged ≤30 years - Kentucky, Tennessee, Virginia, and West Virginia, 2006-2012. MMWR Morb Mortal Wkly Rep. 2015;64(17):453-458.

Hepatitis C Virus

- From 2013 to 2017, there was a **409% increase in the number of newly reported chronic HCV cases in TN**. These findings are thought to be reflective of the following factors in TN: 1) increasing rates of HCV, 2) increasing testing for HCV, and 3) the implementation of centralized chronic HCV surveillance efforts beginning in mid-2015.
- Other notable findings among cases reported from 2013 – 2017 include:
    - Individuals less than 45 years of age accounted for:
        - 50% of new chronic HCV infections, and
        - 80% of acute HCV infections;
    - Women accounted for:
        - 50% of acute and new chronic HCV cases among individuals less than 45 years of age, and
        - 37% of acute and new chronic HCV cases among individuals 45 years of age and older; and
    - **The increased number of HCV cases among women of child-bearing age highlights the risk of increasing rates of infants perinatally exposed to HCV.**

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Background

Tennessee, a southern state which borders eight additional states, is a mid-sized state that consists of 95 counties and is home to over six and half million people. The TN Department of Health's Central Office is located in Nashville and partners with all of the state's 95 counties, which are divided into 13 public health regions. Six of the most populous counties operate as stand-alone metropolitan public health regions, and the remaining 89 counties are divided into seven rural health regions. The rural counties are considered to be an extension of TDH, whereas TDH partners with the metropolitan regions through contractual agreements.

Population

Tennessee was home to 6,715,984 people in 2017, which accounts for approximately 2% of the population in the U.S.[3] The population in TN increased by 221,163 people between 2013 and 2017, a growth of 3%.[3] This increase is reflective of the national growth rate of 3% during the same time period.[3] The geographic areas with the largest percentages of the population include: Memphis/Shelby County, Nashville/Davidson County, and the Mid-Cumberland region.[3]

Age

The median age in TN in 2017 was 38.7, almost a full year older than that median age in the U.S. (37.8).[3] Despite a slightly older median age, the age distribution in TN roughly reflects that of the U.S. population in general.[3]

Race and Ethnicity

According to the most recent census estimates[3], TN's population is mostly white (78.8%) with large minorities that are African American (16.7%) and Hispanic/Latino (5.2%).

Income and Poverty

The median household income in TN in 2016 was $48,574, compared to the national median income of $57,617; 16.7% of TN's population is impoverished, which is greater than the national average of 15.4%.[3] There are noticeable racial and ethnic disparities in household income in TN. White households had a median income of $51,488 in 2016, while Black and Hispanic households had median incomes of $35,673 and $41,013, respectively.[3]

[3] https://www.census.gov/quickfacts/tn

Reporting Laws and Regulations

Acute HBV infection and acute HCV infection are reportable conditions and require notification to TDH within one week of identification. Acute HBV and acute HCV have been reportable since 1995, although baseline data vastly improved in 2015 due to the development and implementation of new NBS pages to facilitate VH-specific data collection. Chronic HCV became laboratory reportable in 2017, although the consumption of chronic HCV lab results was enhanced beginning July 1, 2015.

TDH's Reportable Disease regulations can be located here:

https://www.tn.gov/health/cedep/reportable-diseases.html

<table>
<tr><th>Condition</th><th>Reportable in 2017 (Yes/No)</th><th>Existing Practices</th><th>Barriers/Gaps</th></tr>
<tr><td>Acute HBV</td><td>Yes</td><td rowspan="2">Laboratory results are reported by providers and laboratories either directly into NBS, on paper, and/or via Electronic Laboratory Reporting (ELR). Chronic HBV is not currently reportable in TN.</td><td rowspan="4">There is limited capacity to conduct surveillance and epidemiologic activities on chronic VH conditions due to a lack of routinely entered historical data. Due to the large volume of cases, regional health department staff investigates acute HBV cases, chronic HBV cases in females of childbearing age (11-50), and acute HCV cases. Central Office Health Department staff conducts NBS surveillance activities on chronic HCV cases.</td></tr>
<tr><td>Chronic HBV</td><td>No</td></tr>
<tr><td>Acute HCV</td><td>Yes</td><td rowspan="2">All past and present HCV infections are notifiable diseases. For acute HCV, laboratory results are reported by providers and laboratories either directly into NBS, on paper, and/or via ELR. Chronic HCV was made laboratory reportable beginning January 1, 2017.</td></tr>
<tr><td>Chronic HCV</td><td>Yes</td></tr>
</table>

Viral Hepatitis

HBV

Hepatitis B virus (HBV) infection has been vaccine preventable since 1981. HBV vaccination has been a universally recommended childhood vaccination since 1991, and it is also recommended for unvaccinated at-risk adults. Remarkably, HBV infection remains a major public health challenge in the U.S. Progression of acute to chronic HBV is highly dependent upon age: approximately 90% of perinatally-infected infants become chronically infected, while only about 5% of acutely infected adults become chronically infected. While there is no cure for HBV, treatment is available. Without treatment, approximately 25% of persons with chronic HBV infection die prematurely from cirrhosis or liver cancer. Strategies for the elimination of HBV include: universal vaccination of infants beginning at birth, routine HBV screening of all pregnant women at first prenatal visit, vaccination of previously unvaccinated children and adults, and vaccination of adults at increased risk for infection.

HCV

Hepatitis C virus (HCV) infection is the most common chronic bloodborne pathogen in the U.S. Most cases of acute HCV are asymptomatic and, therefore, go undiagnosed. Progression to chronic HCV occurs in about 75% of persons with acute HCV. Acute HCV infections are on the rise, particularly among younger people who inject drugs[2]; however, about three-fourths of persons in the United States living with chronic HCV infection are Baby Boomers (e.g. born between 1945 and 1965). In 2013, HCV-related mortality surpassed the total combined number of deaths from all other infectious diseases.[4]

Despite new therapies that can cure over 95% of persons with chronic HCV, only about half of those living with HCV are aware of their infection, and most have not received recommended care and treatment. Without diagnosis and treatment, people living with HCV may develop liver cancer, cirrhosis, or other life-threatening HCV-related diseases, and may unknowingly transmit the disease to others.

Risk Factors

There are a number of known transmission risks for HBV and HCV, many overlapping between the two conditions. The main routes of transmission occur primarily when infected blood enters the bloodstream of non-infected individuals. These pathways include, but are not limited to:

- Past or present injection drug use,
- Sharing drug equipment (cotton, cookers, snorting straws, etc.),
- Use of unregulated tattooing equipment,
- Blood transfusions or organ transplants prior to 1992,
- Needle sticks in health care settings,
- Being born to a viral hepatitis-infected mother,
- Sex with a hepatitis-infected person (more common in HBV transmission),
- Sharing personal and household items that are contaminated with infected blood (razors, toothbrushes, diabetic equipment, etc.), and/or
- Breaches in infection control in health care settings (primarily observed in facility-based outbreaks).

[4] https://www.cdc.gov/media/releases/2016/p0504-hepc-mortality.html

Acute Hepatitis B

This section summarizes trends in acute HBV infection in TN from 2013 to 2017.

The CDC/CSTE case definition for acute HBV can be found at:
https://wwwn.cdc.gov/nndss/conditions/hepatitis-b-acute/case-definition/2012/

Of note, TDH has a specific case classification for probable acute HBV infection (see Glossary for definition).

Figure 1 - Case Counts and Rates of Confirmed and Probable Acute HBV Infection, Tennessee, 2013-2017

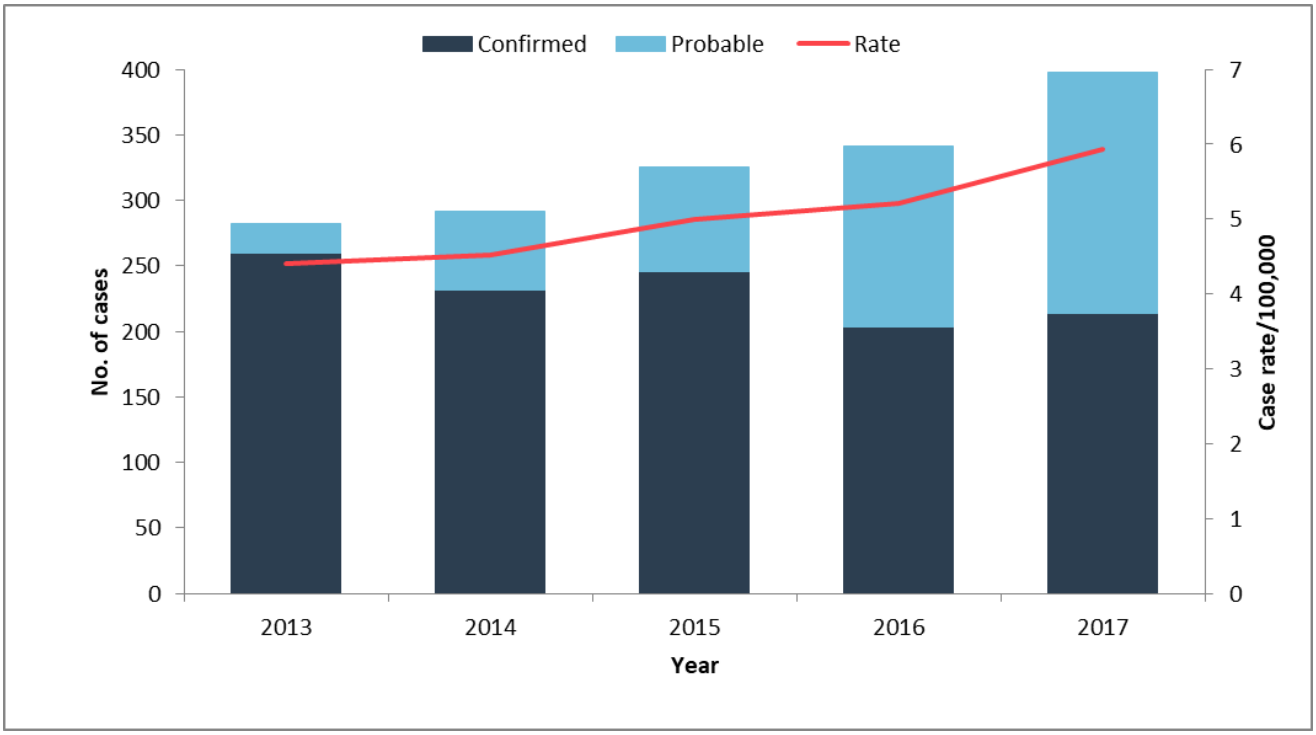
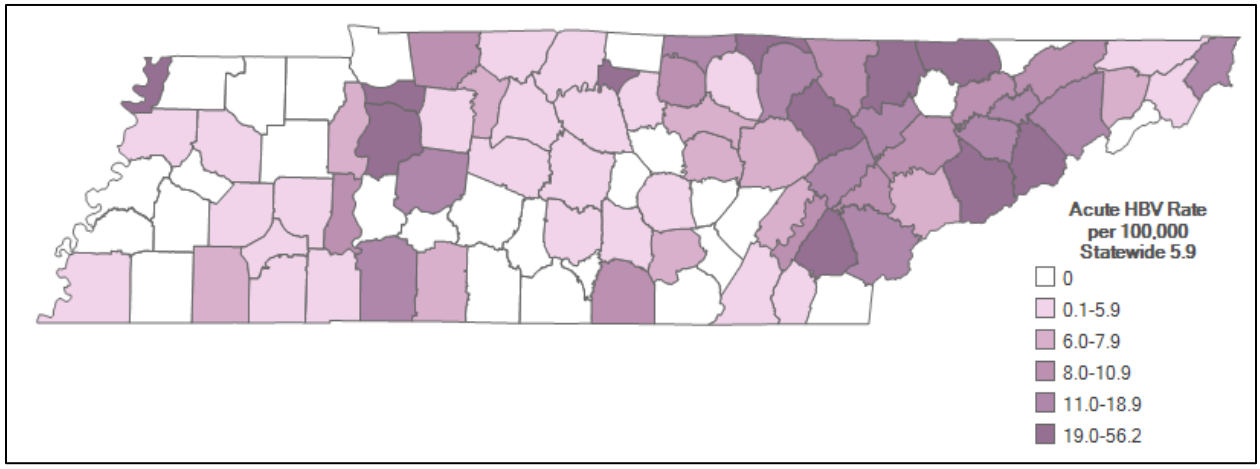


Table 1 - Case Counts and Rates of Confirmed and Probable Acute HBV Infection, Tennessee, 2013-2017

Cases and Case Rates per 100,000 population	2013		2014		2015		2016		2017	
	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate
Total Cases	282	4.4	292	4.5	325	5.0	341	5.2	398	5.9
Confirmed Only	260	4.1	232	3.6	246	3.8	203	3.1	214	3.2
Probable Only	22	0.3	60	0.9	79	1.2	138	2.1	184	2.7

From 2013 to 2017, case counts and rates of total acute HBV (confirmed and probable) increased in TN. This increase was driven by an increase in the rate of acute probable HBV cases (an 800% increase) as compared to a 22% decrease in the rate of acute confirmed HBV cases over the same period of time. In 2017, the proportion of total acute HBV cases attributed to acute probable HBV was 46%, as compared to 8% in 2013.

Figure 2 - Case Rates of Confirmed and Probable Acute HBV Infection by County, Tennessee, 2017



Northeastern TN is home to the most counties in the state with the highest rates of acute HBV.

Figure 3 - Case Counts and Rates of Confirmed and Probable Acute HBV Infection by Gender, Tennessee, 2013-2017

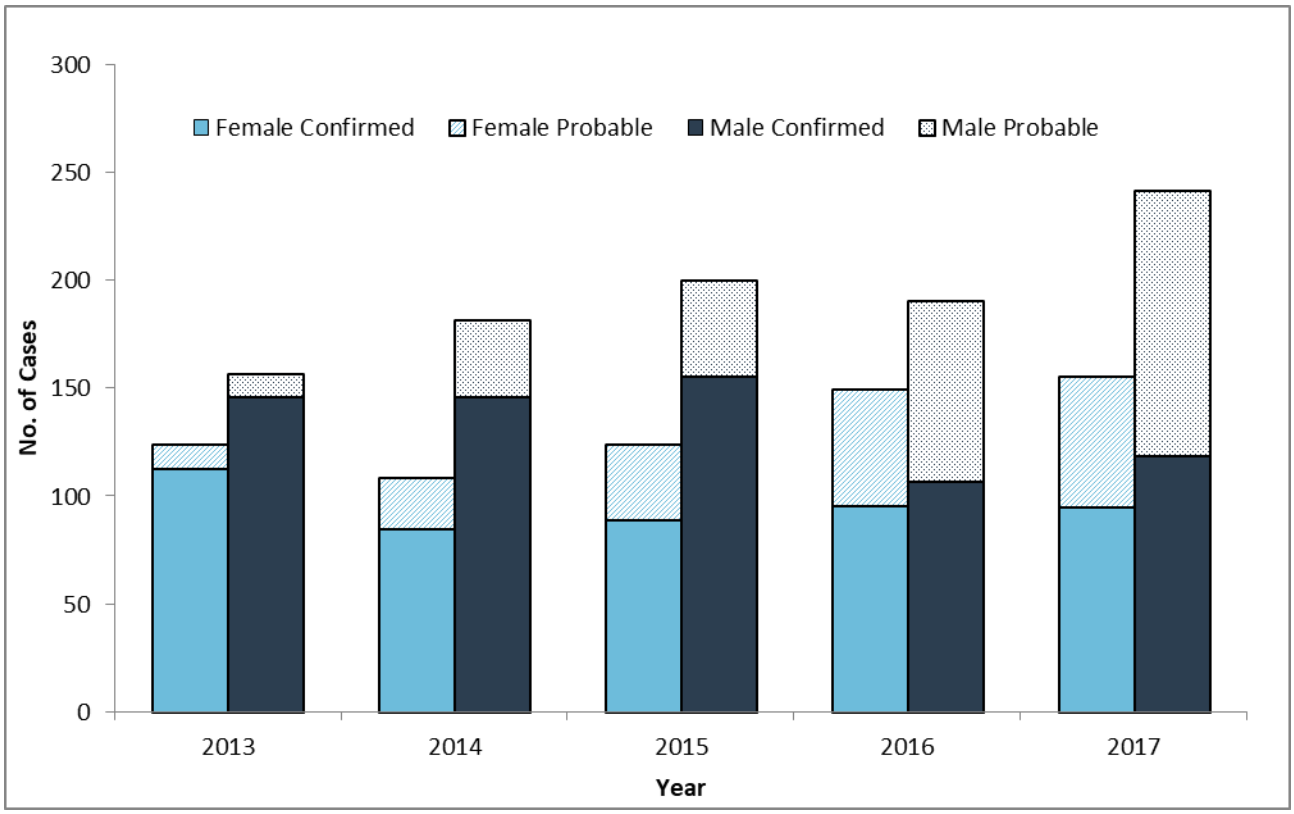


Table 2 - Case Counts and Rates of Confirmed and Probable Acute HBV Infection by Gender, Tennessee, 2013-2017

Gender	2013		2014		2015		2016		2017	
	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate
Total Cases	282	4.4	292	4.5	325	5.0	341	5.2	398	5.9
Female	124	3.8	109	3.3	124	3.7	150	4.5	156	4.5
Male	157	5.0	182	5.8	200	6.3	191	6.0	242	7.4

From 2013 to 2017, rates of acute HBV (confirmed and probable) in TN have consistently been higher among men than women, although rates have continued to climb in both groups.

Figure 4 - Case Counts of Confirmed and Probable Acute HBV Infection by Age Group, Tennessee, 2013-2017

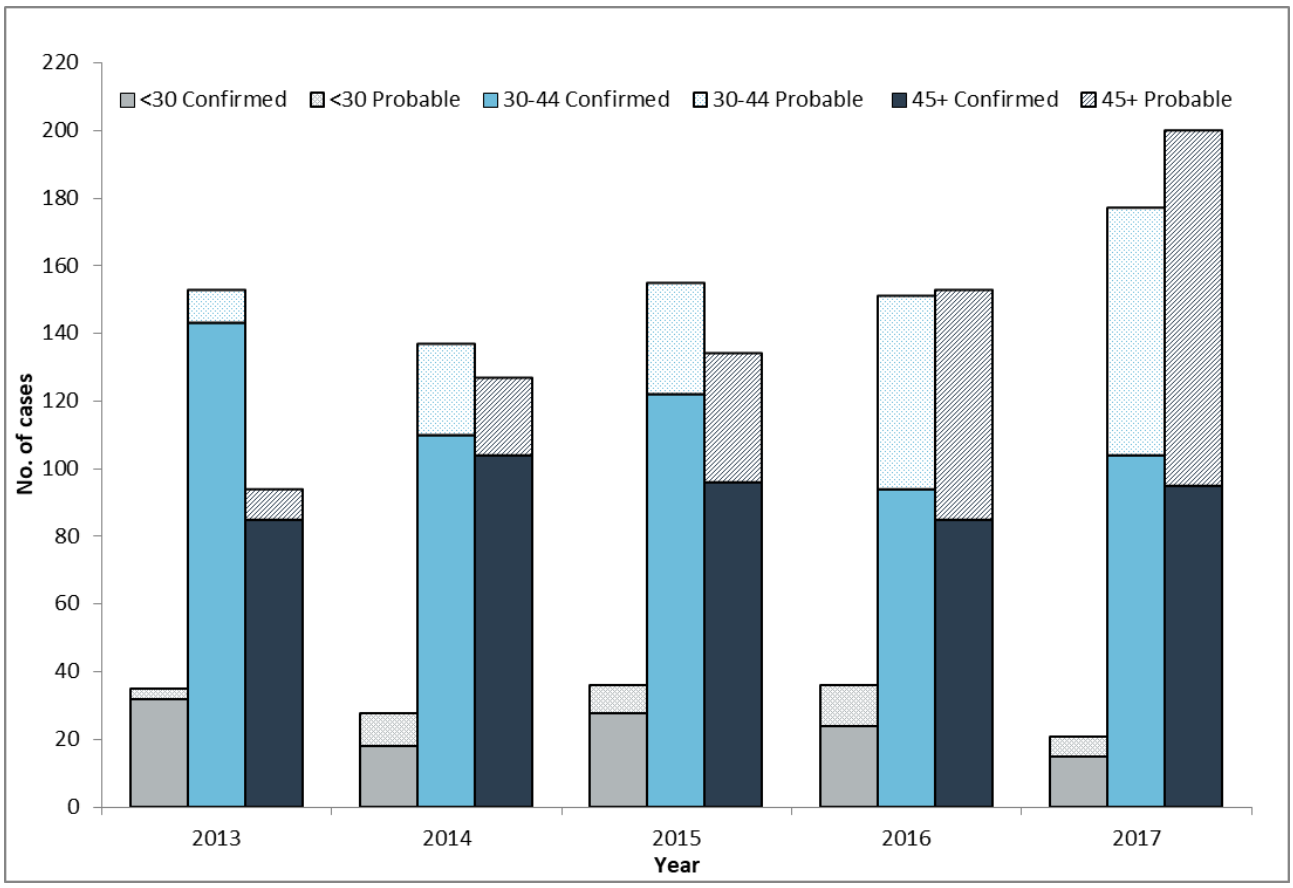


Table 3 – Case Counts and Rates of Confirmed and Probable Acute HBV Infection by Age Group, Tennessee, 2013-2017

Age Group (years)	2013		2014		2015		2016		2017	
	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate
Total Cases	282	4.4	292	4.5	325	5.0	341	5.2	398	5.9
<30	35	1.4	28	1.1	36	1.4	36	1.4	21	0.8
30-44	153	12.1	137	10.8	155	12.3	151	12.0	177	14.0
45+	94	3.5	127	4.7	134	4.8	153	5.4	200	7.0
Confirmed	260	4.1	232	3.6	246	3.8	203	3.1	214	3.2
<30	32	1.3	18	0.7	28	1.1	24	0.9	15	0.6
30-44	143	11.3	110	8.7	122	9.7	94	7.5	104	8.2
45+	85	3.2	104	3.8	96	3.5	85	3.0	95	3.3
Probable	22	0.3	60	0.9	79	1.2	137	2.1	184	2.7
<30	3	0.1	10	0.4	8	0.3	12	0.5	6	0.2
30-44	10	0.8	27	2.1	33	2.6	57	4.5	73	5.8
45+	9	0.3	23	0.8	38	1.4	68	2.4	105	3.7

From 2013 to 2017, rates of acute HBV (confirmed and probable) in TN have consistently been higher among the 30-44 year old age group when compared to the other two age groups.

The lower case counts and rates in those less than 30 years old is likely due to increased vaccine coverage from routine childhood vaccination against HBV.

Figure 5 - Case Counts of Confirmed and Probable Acute HBV Infection by Age Group and Gender, Tennessee, 2013-2017

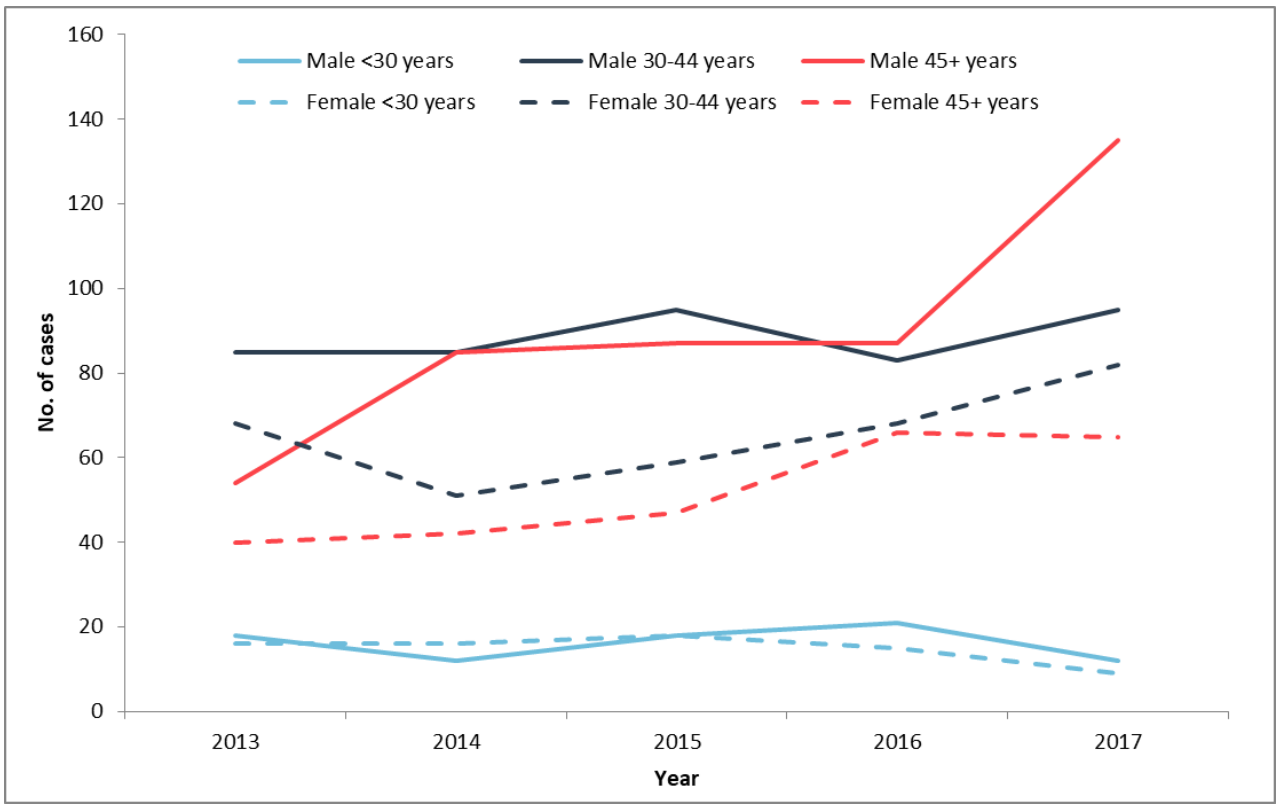


Figure 6 - Rates of Confirmed and Probable Acute HBV Infection by Age Group and Gender, Tennessee, 2013-2017

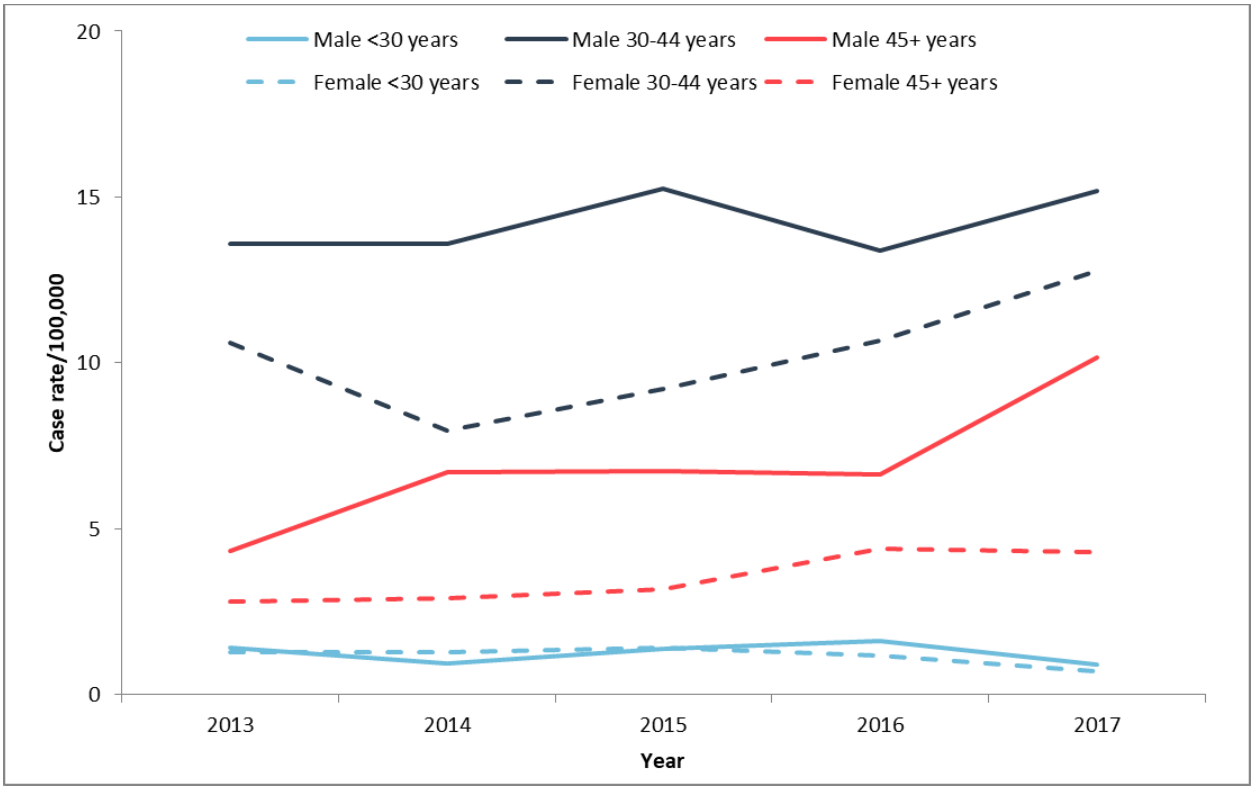
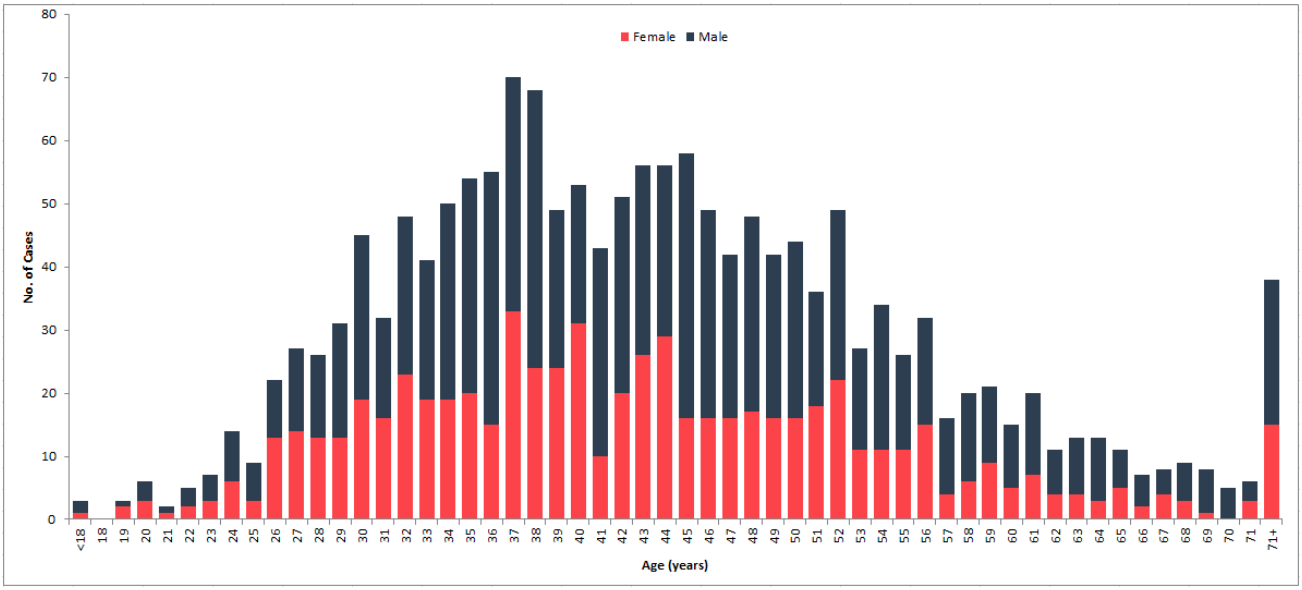


Table 4 - Case Counts and Rates of Confirmed and Probable Acute HBV Infection by Age Group and Gender, Tennessee, 2013-2017

Age Group (years)	2013		2014		2015		2016		2017	
	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate
Total Cases	282	4.4	292	4.5	325	5.0	341	5.2	398	5.9
Female	124	3.8	109	3.3	124	3.7	150	4.5	156	4.5
<30	16	1.3	16	1.3	18	1.4	15	1.2	9	0.7
30-44	68	10.6	51	7.9	59	9.2	68	10.7	82	12.8
45+	40	2.8	42	2.9	47	3.2	66	4.4	65	4.3
Male	157	5.0	182	5.8	200	6.3	191	6.0	242	7.4
<30	18	1.4	12	0.9	18	1.4	21	1.6	12	0.9
30-44	85	13.6	85	13.6	95	15.2	83	13.4	95	15.2
45+	54	4.3	85	6.7	87	6.7	87	6.6	135	10.2

Figure 7 - Case Counts of Confirmed and Probable Acute HBV Infection by Age and Gender, Tennessee, 2013-2017



From 2013 to 2017, rates of acute HBV among males and females have consistently been highest among the 30-44 year old age group when compared to the other age groups. Among all age groups, rates have been higher among men than women.

Figure 8 - Case Counts of Confirmed and Probable Acute HBV Infection by Race/Ethnicity, Tennessee, 2013-2017

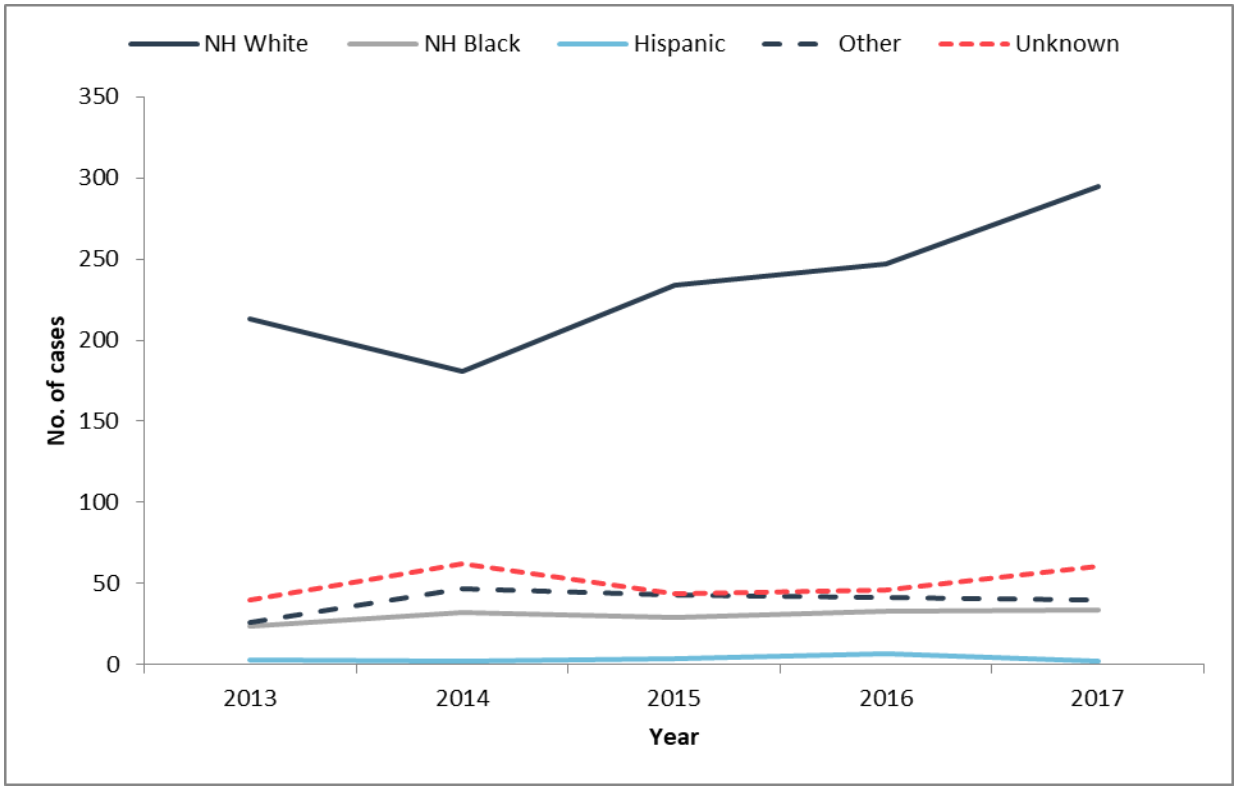


Figure 9 - Rates of Confirmed and Probable Acute HBV Infection by Race/Ethnicity, Tennessee, 2013-2017

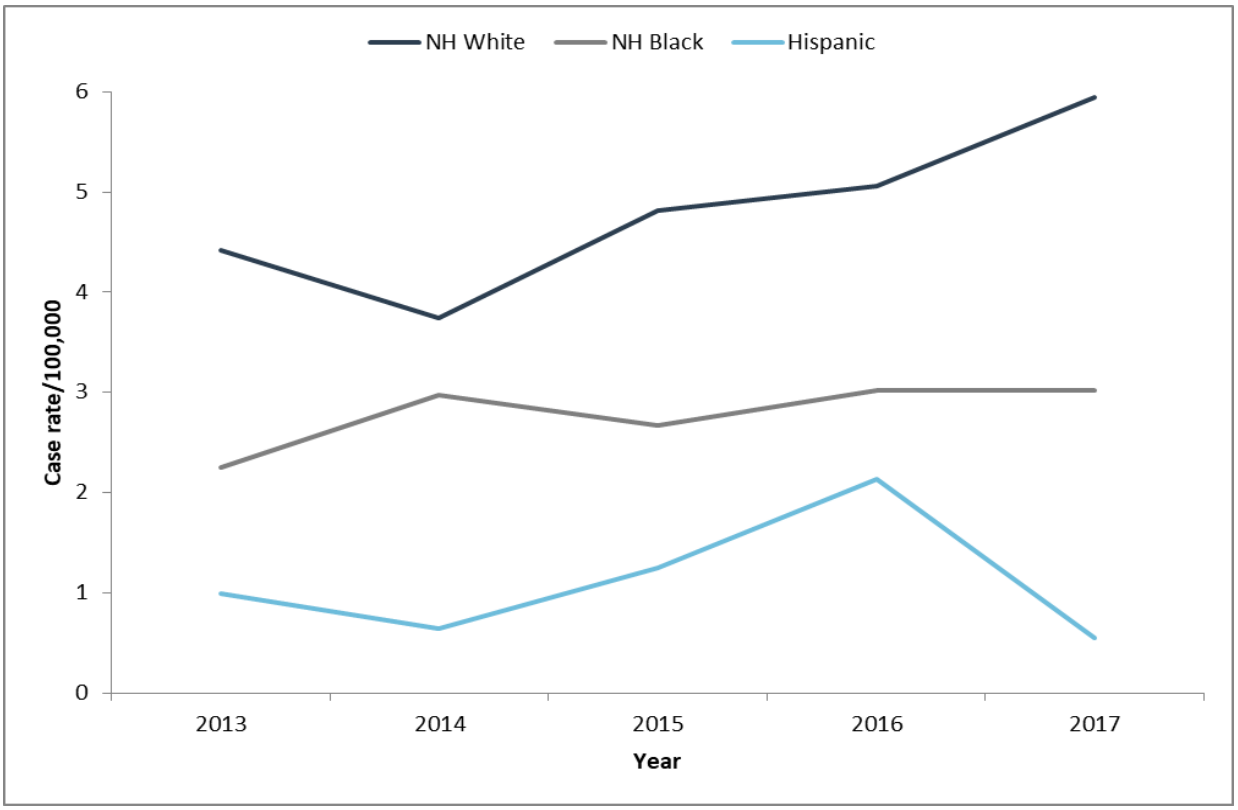


Table 5 - Case Counts and Rates of Confirmed and Probable Acute HBV Infection by Race/Ethnicity, Tennessee, 2013-2017

Race/Ethnicity	2013		2014		2015		2016		2017	
	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate
Total Cases	282	4.4	292	4.5	325	5.0	341	5.2	398	5.9
NH White	213	4.4	181	3.7	234	4.8	247	5.1	295	5.9
NH Black	24	2.3	32	3.0	29	2.7	33	3.0	34	3.0
Hispanic	3	1.0	2	0.6	4	1.2	7	2.1	2	0.5
Other	26	12.0	47	20.6	43	18.0	41	16.5	40	15.4
Unknown	40	-	62	-	44	-	46	-	61	-

The large majority of cases in each year occurred among non-Hispanic Whites, followed by non-Hispanic Blacks, other racial groups, and those with a Hispanic ethnicity.

Figure 10 - Percentage of Confirmed and Probable Acute HBV Infection by Self-Reported Select Risk Factors, Tennessee, 2013-2017

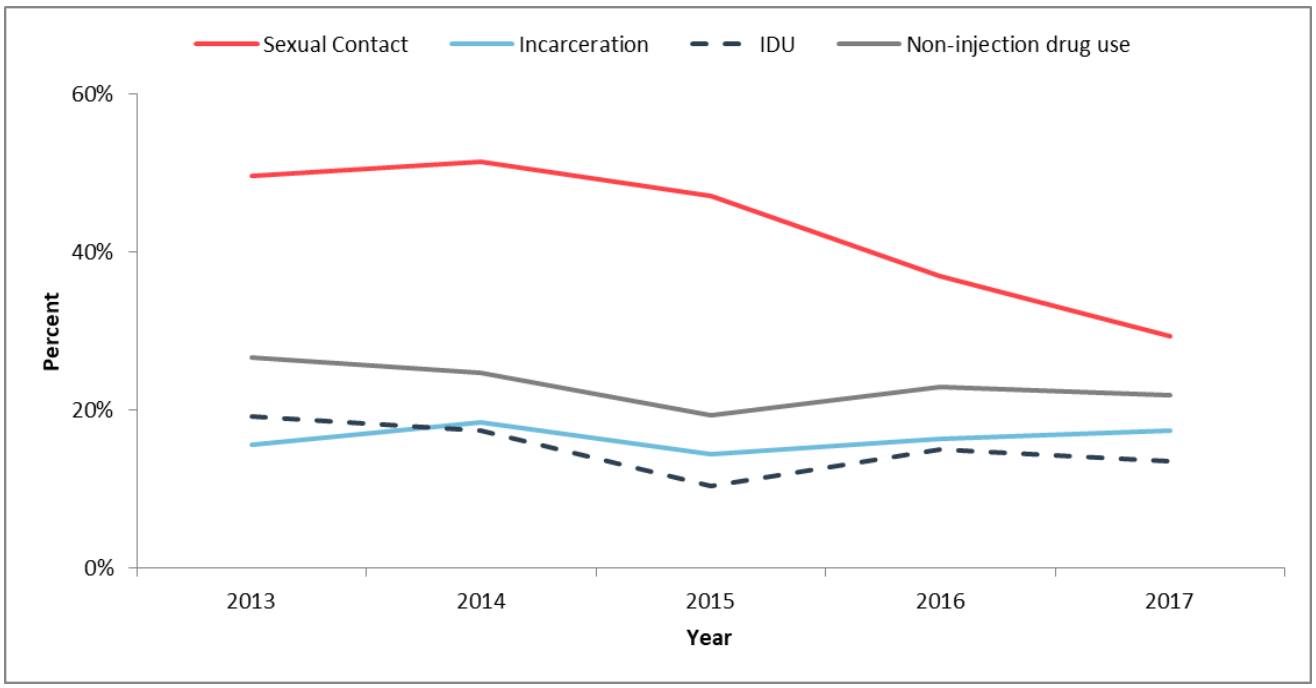


Table 6 - Cases of Confirmed and Probable Acute HBV Infection, Select Self-Reported Risk Factors, Tennessee, 2013-2017

Risk Factors	2013		2014		2015		2016		2017	
	Cases	%	Cases	%	Cases	%	Cases	%	Cases	%
Total Cases	282	-	292	-	325	-	341	-	398	-
Sexual Contact	140	49.6	150	51.4	153	47.1	126	37.0	117	29.4
Hx of Incarceration	44	15.6	54	18.5	47	14.5	56	16.4	69	17.3
Intravenous Drug Use	54	19.1	51	17.5	34	10.5	51	15.0	54	13.6
Non-injection Drug Use	75	26.6	72	24.7	63	19.4	78	22.9	87	21.9

From 2013 to 2017, among cases with self-reported risk factor information available, the highest proportion of cases reported sexual contact with an HBV-infected person as a risk factor for acute HBV followed by non-injection drug use. Self-reported risk factors are not mutually exclusive.

Acute Hepatitis C

This section summarizes trends in acute HCV infection in TN from 2013 to 2017.

The CDC/CSTE case definition for acute HCV can be found at:
https://wwwn.cdc.gov/nndss/conditions/hepatitis-c-acute/case-definition/2016/

Figure 11 - Case Counts and Rates of Confirmed and Probable Acute HCV Infection, Tennessee, 2013-2017

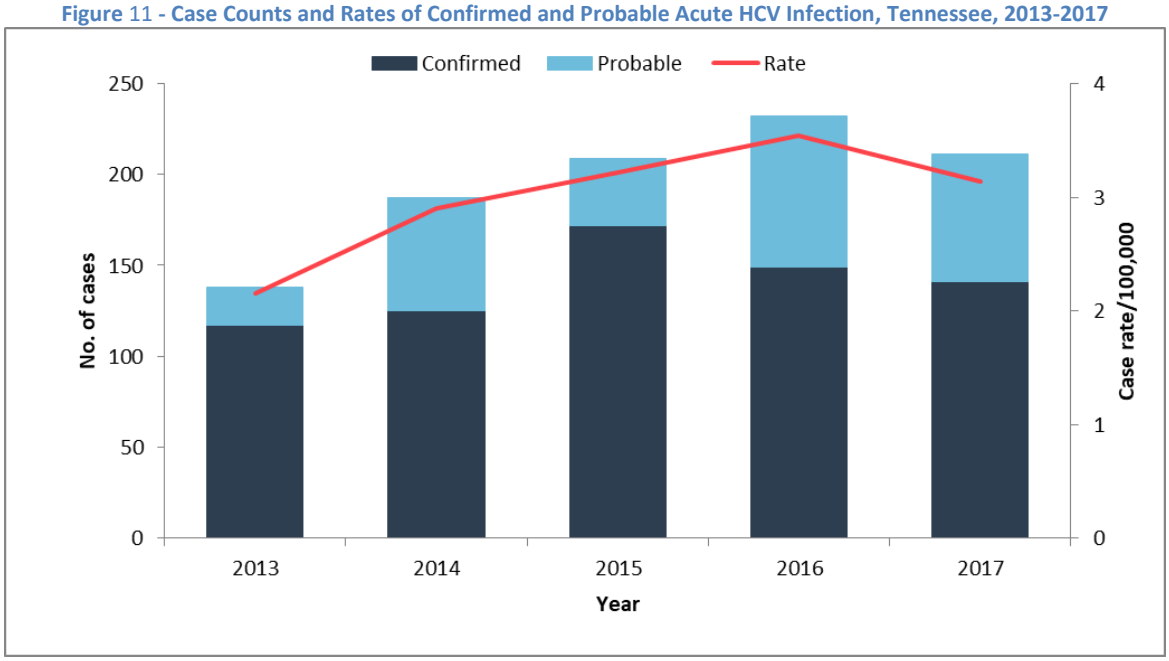
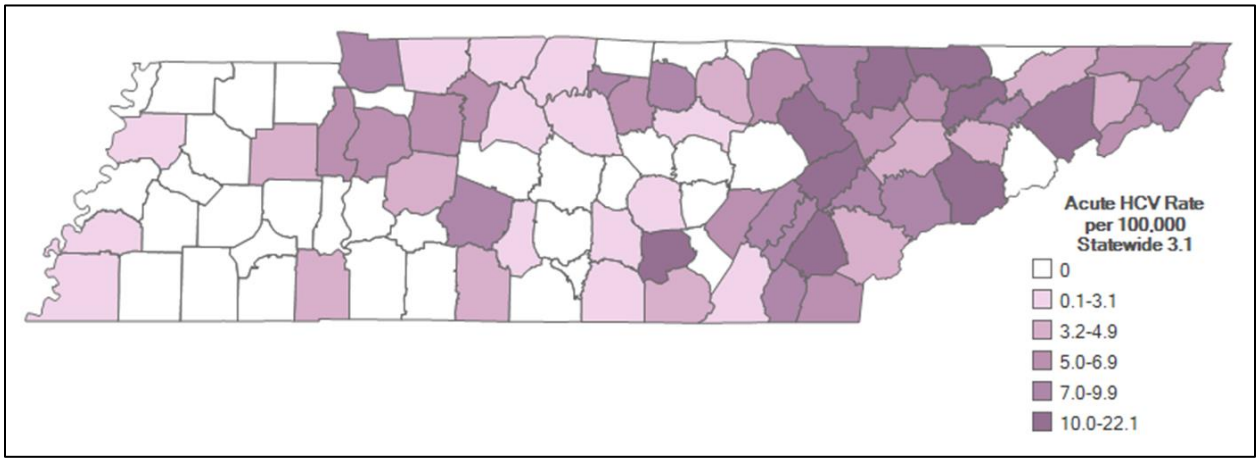


Table 7 - Case Counts and Rates of Confirmed and Probable Acute HCV Infection, Tennessee, 2013-2017

Cases and Case Rates per 100,000 population	2013		2014		2015		2016		2017	
	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate
Total Cases	138	2.2	187	2.9	209	3.2	232	3.5	211	3.1
Confirmed Only	117	1.8	125	1.9	172	2.6	149	2.3	141	2.1
Probable Only	21	0.3	62	1.0	37	0.6	83	1.3	70	1.0

From 2013 to 2017, case counts and rates of acute HCV increased in TN. The rate of acute HCV increased 41% from 2.2 cases per 100,000 in 2013 to 3.1 cases per 100,000 in 2017. This increase can likely be attributed to enhanced surveillance efforts by TDH, as well as the growing HCV epidemic driven by injection drug use.

Figure 12 - Case Rates of Confirmed and Probable Acute HCV Infection by County, Tennessee, 2017



Similar to acute HBV, northeastern TN is home to the most counties in the state with the highest rates of acute HCV.

Figure 13 - Case Counts and Rates of Confirmed and Probable Acute HCV Infection by Gender, Tennessee, 2013-2017

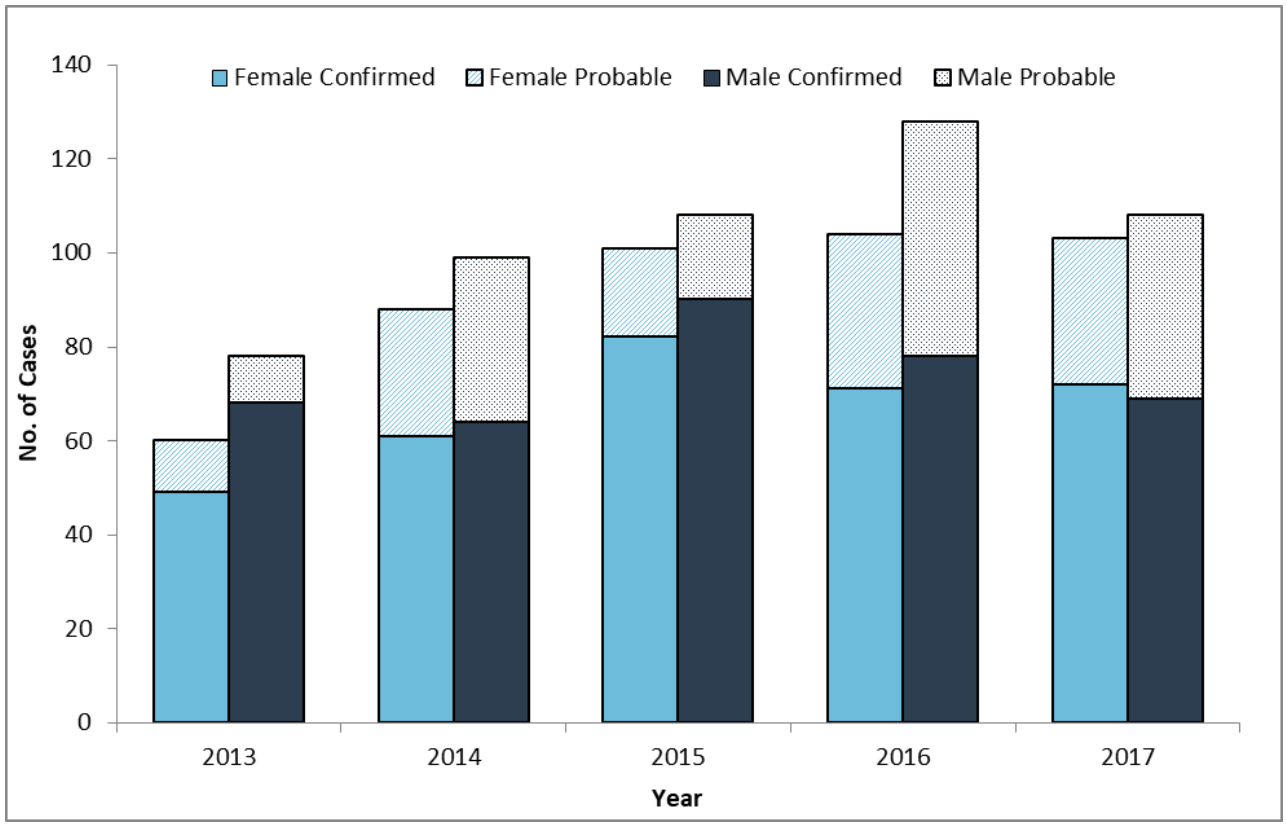


Table 8 - Case Counts and Rates of Confirmed and Probable Acute HCV Infection by Gender, Tennessee, 2013-2017

Gender	2013		2014		2015		2016		2017	
	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate
Total Cases	138	2.2	187	2.9	209	3.2	232	3.5	211	3.1
Female	60	1.8	88	2.7	101	3.0	104	3.1	103	3.0
Male	78	2.5	99	3.1	108	3.4	128	4.0	108	3.3

From 2013 to 2017, rates of acute HCV in TN have been similar among men and women, though men have slightly higher rates than women.

Figure 14 - Case Counts of Confirmed and Probable Acute HCV Infection by Age Group, Tennessee, 2013-2017

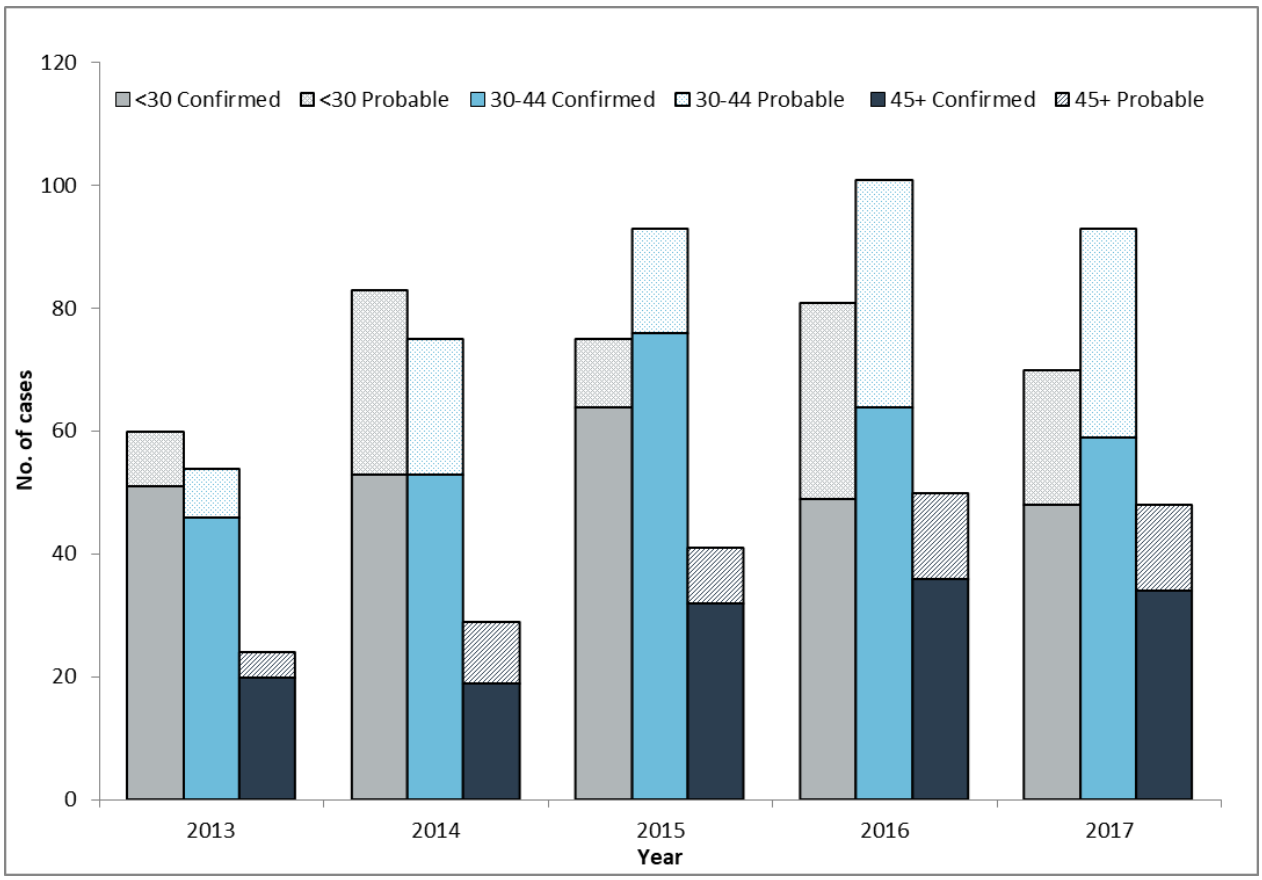


Table 9 - Case Counts and Rates of Confirmed and Probable Acute HCV Infection by Age Group, Tennessee, 2013-2017

Age Group (years)	2013		2014		2015		2016		2017	
	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate
Total Cases	138	2.2	187	2.9	209	3.2	232	3.5	211	3.1
<30	60	2.4	83	3.2	75	2.9	81	3.1	70	2.7
30-44	54	4.3	75	5.9	93	7.4	101	8.0	93	7.3
45+	24	0.9	29	1.1	41	1.5	50	1.8	48	1.7
Confirmed	117	1.8	125	1.9	172	2.6	149	2.3	141	2.1
<30	51	1.3	53	1.4	64	1.7	49	1.3	48	1.8
30-44	46	2.4	53	2.8	76	4.0	64	3.4	59	4.7
45+	20	0.5	19	0.5	32	0.8	36	0.9	34	1.2
Probable	21	0.3	62	1.0	37	0.6	83	1.3	70	1.0
<30	9	0.2	30	0.8	11	0.3	32	0.8	22	0.8
30-44	8	0.4	22	1.2	17	0.9	37	2.0	34	2.7
45+	4	0.1	10	0.3	9	0.2	14	0.3	14	0.5

From 2013 to 2017, rates of acute HCV in TN have consistently been higher among the 30-44 year old age group when compared to the other two age groups.

Figure 15 - Case Counts of Confirmed and Probable Acute HCV Infection by Age Group and Gender, Tennessee, 2013-2017

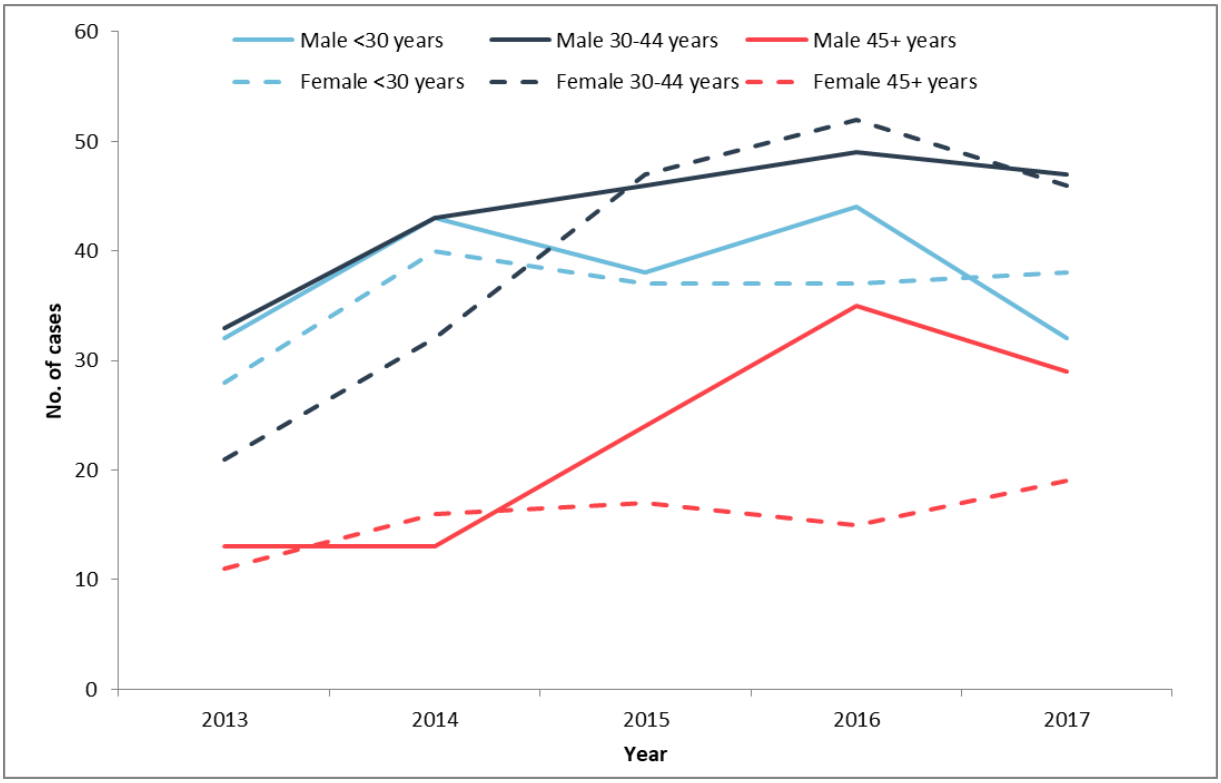


Figure 16 - Rates of Confirmed and Probable Acute HCV Infection by Age Group and Gender, Tennessee, 2013-2017

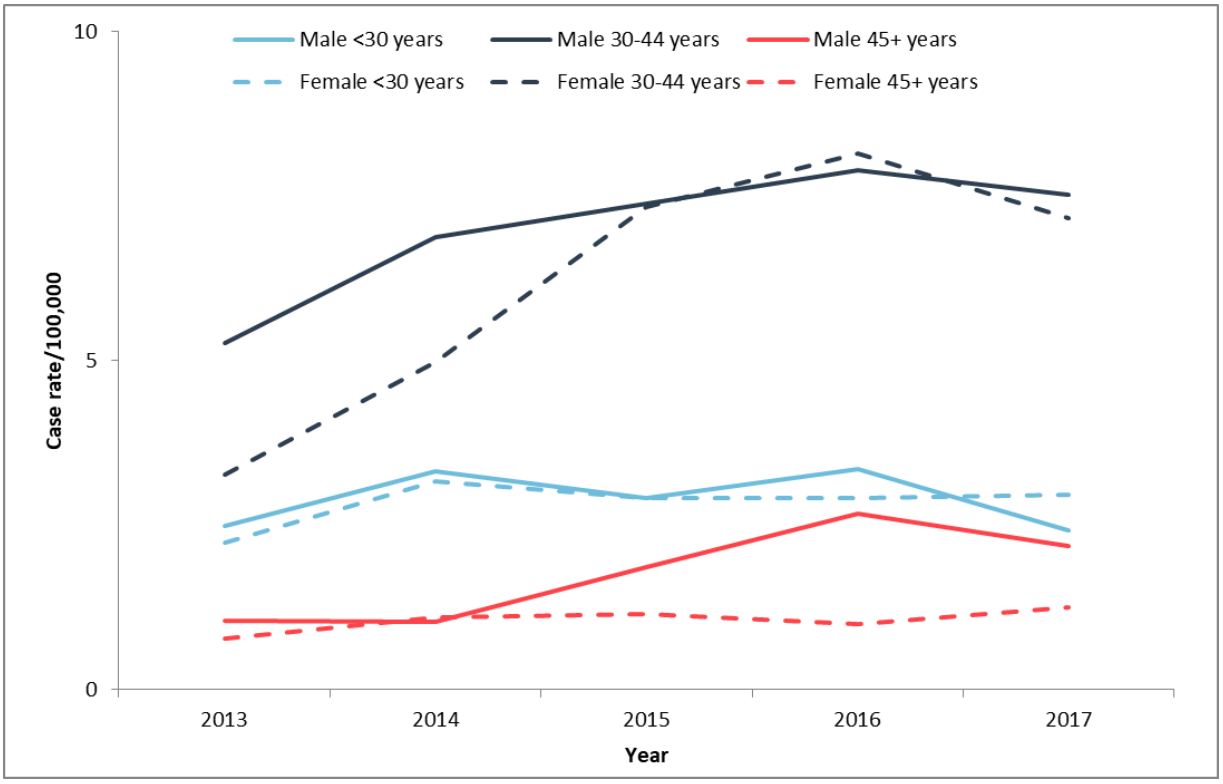
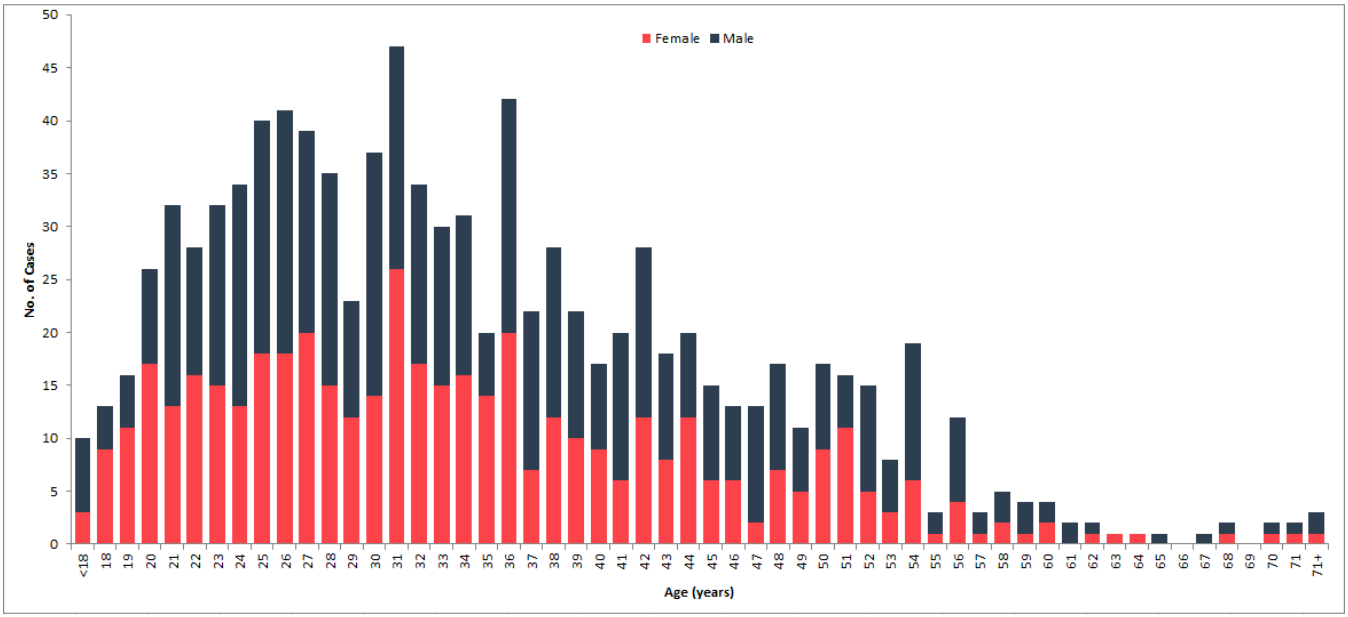


Table 10 - Case Counts and Rates of Confirmed and Probable Acute HCV Infection by Age Group and Gender, Tennessee, 2013-2017

Age Group (years)	2013		2014		2015		2016		2017	
	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate
Total Cases	138	2.2	187	2.9	209	3.2	232	3.5	211	3.1
Female	60	1.8	88	2.7	101	3.0	104	3.1	103	3.0
<30	28	2.2	40	3.2	37	2.9	37	2.9	38	3.0
30-44	21	3.3	32	5.0	47	7.3	52	8.2	46	7.2
45+	11	0.8	16	1.1	17	1.2	15	1.0	19	1.3
Male	78	2.5	99	3.1	108	3.4	128	4.0	108	3.3
<30	32	2.5	43	3.3	38	2.9	44	3.4	32	2.4
30-44	33	5.3	43	6.9	46	7.4	49	7.9	47	7.5
45+	13	1.0	13	1.0	24	1.9	35	2.7	29	2.2

Figure 17 - Case Counts of Confirmed and Probable Acute HCV Infection by Age and Gender, Tennessee, 2013-2017



From 2013 to 2017, rates of acute HCV among males and females have consistently been highest among the 30-44 year old age group when compared to the other age groups. The majority of all cases have been in individuals under the age of 45 years. Among all age groups, rates have been similar among men and women.

Figure 18 - Case Counts of Confirmed and Probable Acute HCV Infection by Race/Ethnicity, Tennessee, 2013-2017

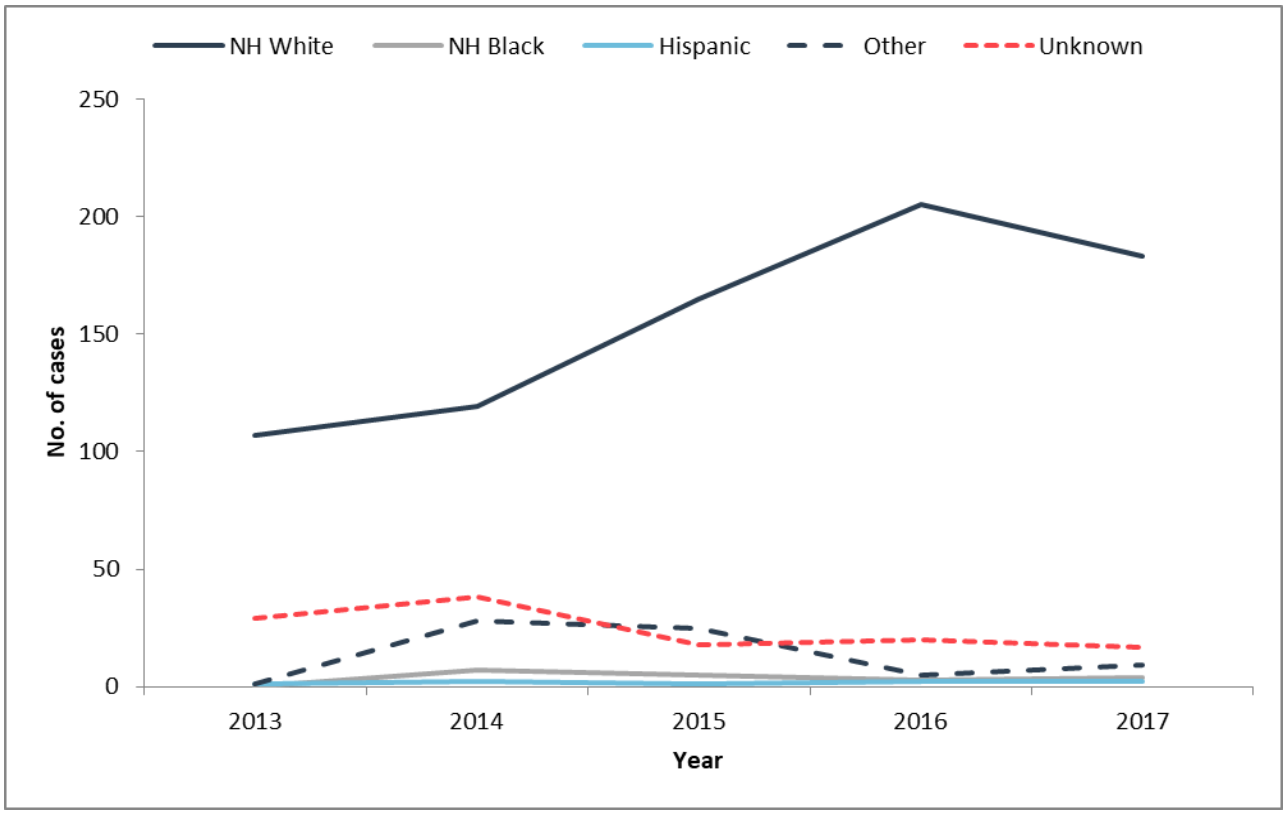


Figure 19 - Rates of Confirmed and Probable Acute HCV Infection by Race/Ethnicity, Tennessee, 2013-2017

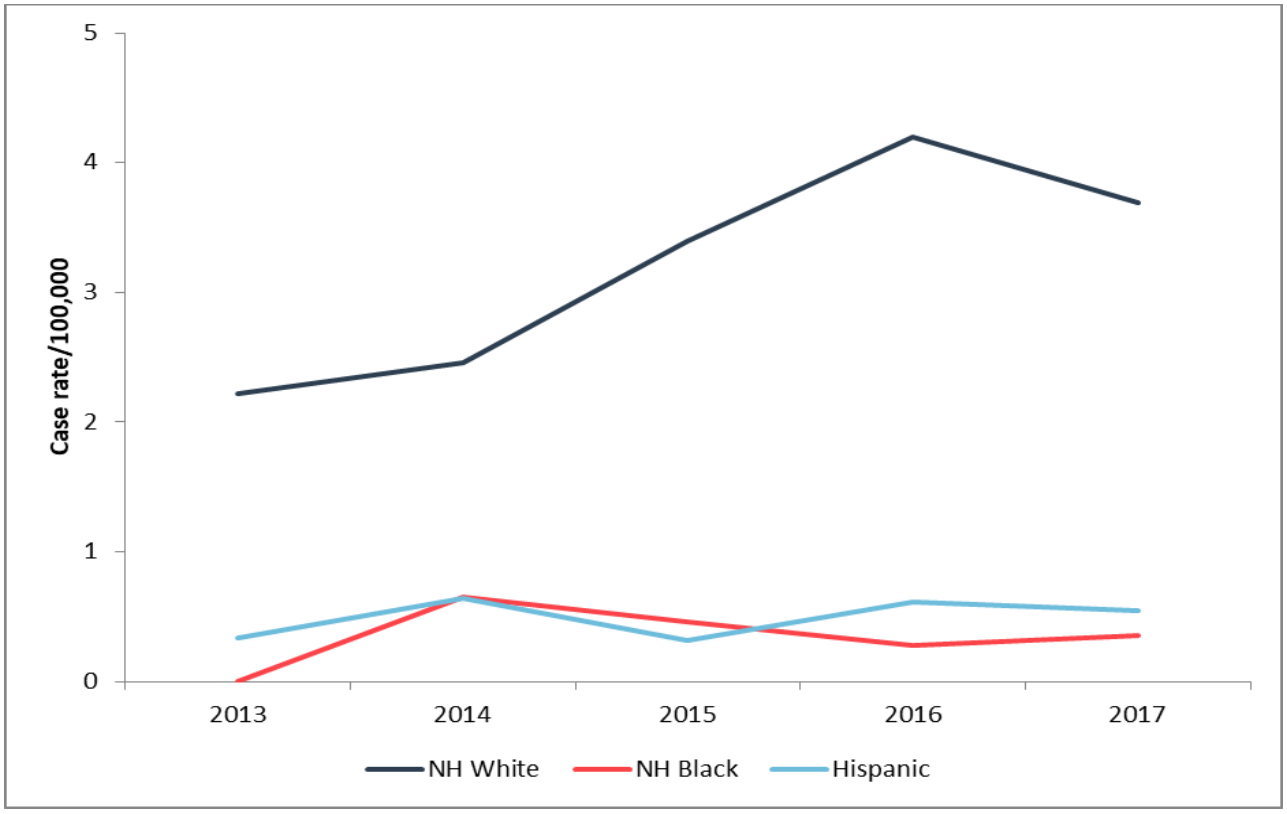


Table 11 - Case Counts and Rates of Confirmed and Probable Acute HCV Infection by Race/Ethnicity, Tennessee, 2013-2017

Race/Ethnicity	2013		2014		2015		2016		2017	
	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate
Total Cases	138	2.2	187	2.9	209	3.2	232	3.5	211	3.1
NH White	107	2.2	119	2.5	165	3.4	205	4.2	183	3.7
NH Black	0	0.0	7	0.7	5	0.5	3	0.3	4	0.4
Hispanic	1	0.3	2	0.6	1	0.3	2	0.6	2	0.5
Other	1	0.5	28	12.3	25	10.5	5	2.0	9	3.5
Unknown	29	-	38	-	18	-	20	-	17	-

Similar to acute HBV, the large majority of acute HCV cases in each year occurred among non-Hispanic Whites.

Figure 20 - Cases of Confirmed and Probable Acute HCV Infection by Select Self-Reported Risk Factors, Tennessee, 2013-2017

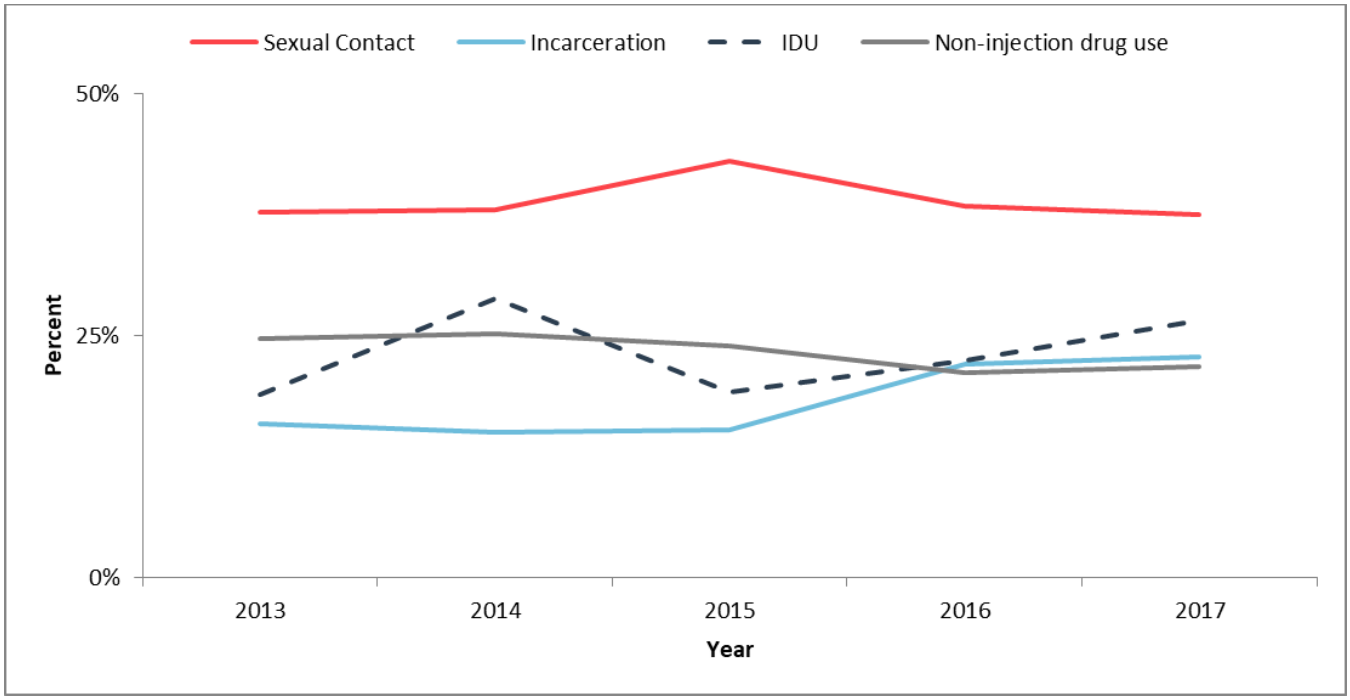


Table 12 - Case Counts of Confirmed and Probable Acute HCV Infection by Select Self-Reported Risk Factors, Tennessee, 2013-2017

Risk Factors	2013		2014		2015		2016		2017	
	Cases	%	Cases	%	Cases	%	Cases	%	Cases	%
Total Cases	138	-	187	-	209	-	232	-	211	-
Sexual Contact	52	37.7	71	38.0	90	43.1	89	38.4	79	37.4
Hx of Incarceration	22	15.9	28	15.0	32	15.3	51	22.0	48	22.7
Intravenous Drug Use	26	18.8	54	28.9	40	19.1	52	22.4	56	26.5
Non-injection Drug Use	34	24.6	47	25.1	50	23.9	49	21.1	46	21.8

From 2013 to 2017, among cases with self-reported risk factor information available, the highest proportion of cases reported sexual contact with an HCV-infected person as a risk factor for acute HCV. The proportion of individuals reporting history of incarceration and injection/non-injection drug use have remained relatively stable. Self-reported risk factors are not mutually exclusive.

Chronic Hepatitis C

This section summarizes trends in chronic HCV infection in TN from 2013 to 2017.

The CDC/CSTE case definition for chronic HCV can be found at:
https://wwwn.cdc.gov/nndss/conditions/hepatitis-c-chronic/case-definition/2016/

Figure 21 - Case Counts and Rates of Newly Reported Confirmed and Probable Chronic HCV Infection, Tennessee, 2013-2017

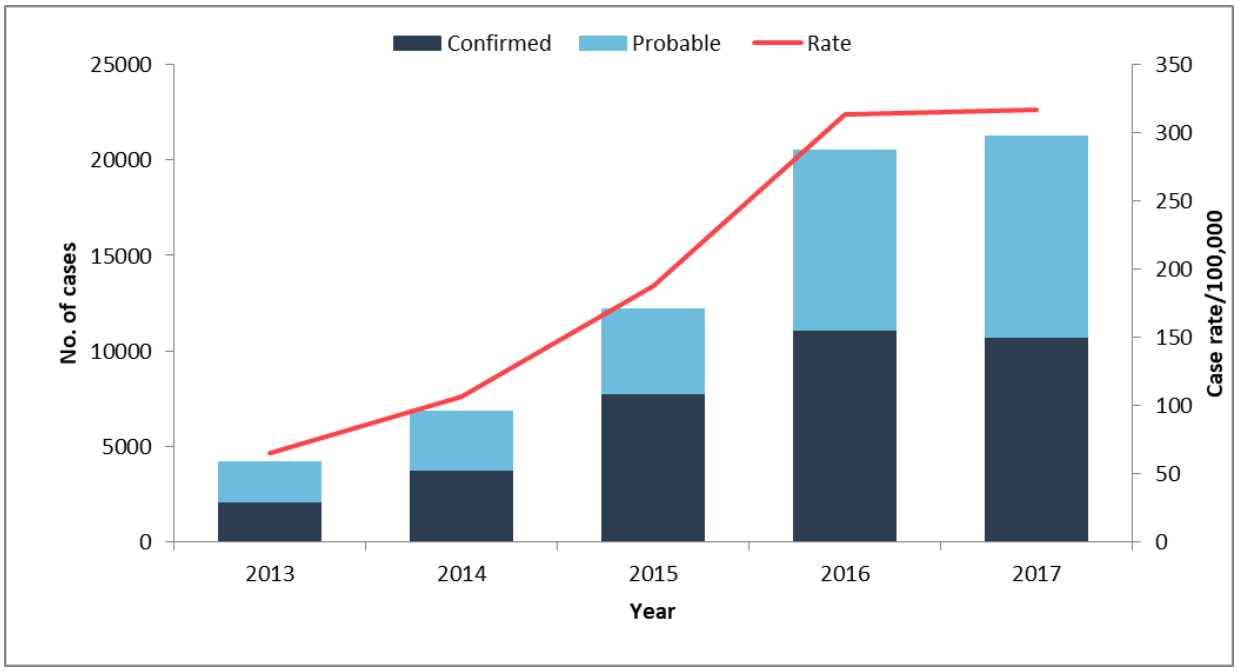
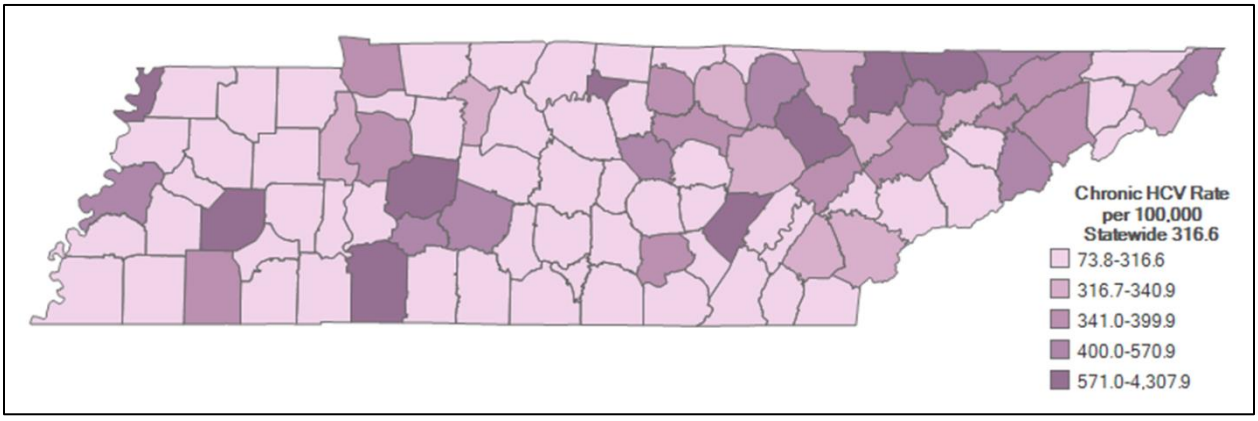


Table 13 - Case Counts and Rates of Newly Reported Confirmed and Probable Chronic HCV Infection, Tennessee, 2013-2017

Cases and Case Rates per 100,000 population	2013		2014		2015		2016		2017	
	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate
Total Cases	4,181	65.3	6,866	106.4	12,213	187.9	20,513	313.3	21,264	316.6
Confirmed Only	2,070	32.3	3,771	58.5	7,782	119.7	11,063	169.0	10,709	159.5
Probable Only	2,111	33.0	3,095	48.0	4,431	68.2	9,450	144.3	10,555	157.2

Enhanced chronic HCV surveillance in TN began mid-2015, with the first complete year of centralized chronic HCV data available in 2016. As a result of this increased capacity to consume chronic HCV laboratory data and the growing epidemic of HCV driven by injection drug use, rates of chronic HCV have increased 385%, from 65.3 cases of chronic HCV per 100,000 in 2013 to 316.6 cases per 100,000 in 2017.

Figure 22 – Case Rates of Newly Reported Confirmed and Probable Chronic HCV Infection by County, Tennessee, 2017



Cases of chronic HCV are found in all counties in TN. Similar to acute HBV and HCV, northeastern TN is home to many of the counties in the state with the highest rates of chronic HCV.

Figure 23 - Case Counts and Rates of Newly Reported Confirmed and Probable Chronic HCV Infection by Gender, Tennessee, 2013-2017

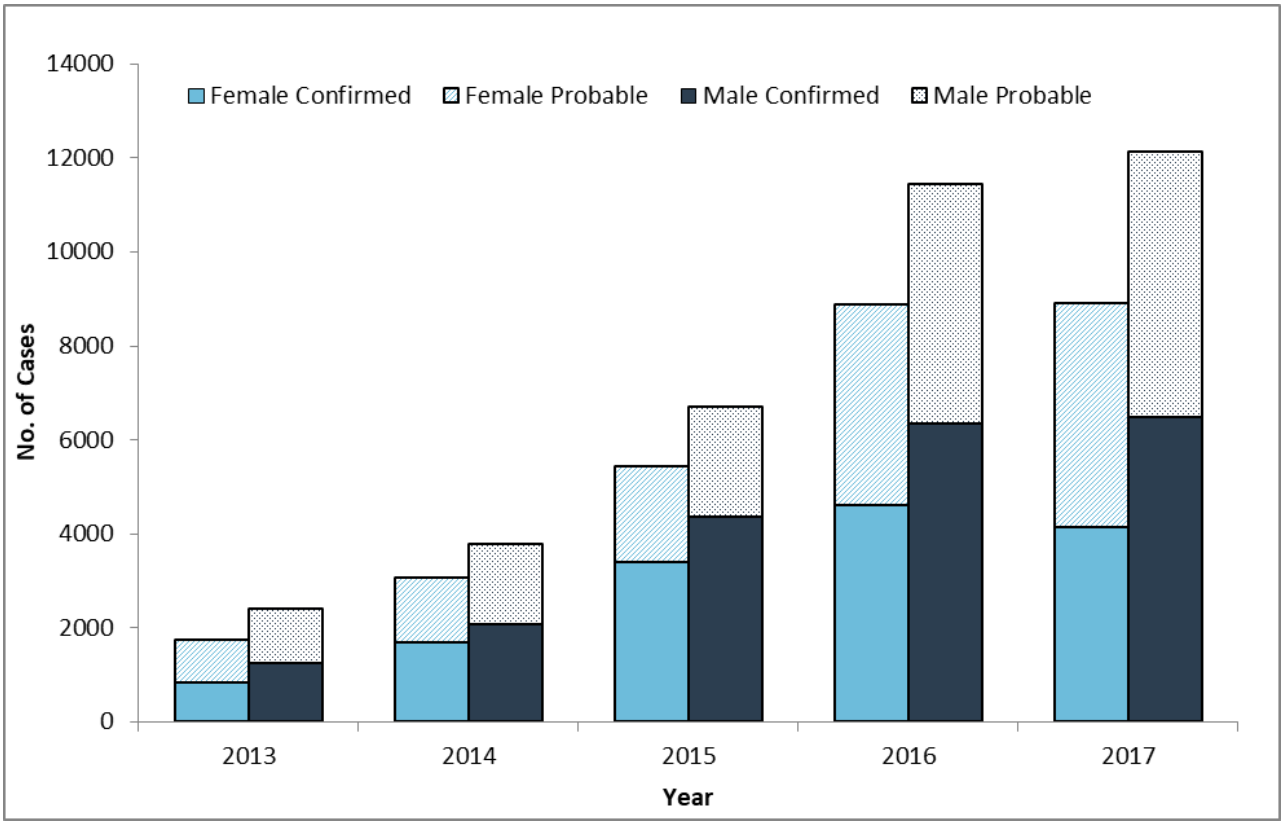


Table 14 - Case Counts and Rates of Newly Reported Confirmed and Probable Chronic HCV Infection by Gender, Tennessee, 2013-2017

Gender	2013		2014		2015		2016		2017	
	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate
Total Cases	4,181	65.3	6,866	106.4	12,213	187.9	20,513	313.3	21,264	316.6
Female	1,751	53.4	3,057	92.4	5,444	163.4	8,880	264.6	8,897	258.6
Male	2,412	77.3	3,777	120.2	6,690	211.2	11,433	358.2	12,131	370.3

From 2013 to 2017, rates of chronic HCV in TN have consistently been higher among men than women, although rates have continued to climb in both groups.

Figure 24 - Case Counts of Newly Reported Confirmed and Probable Chronic HCV Infection by Age Group, Tennessee, 2013-2017

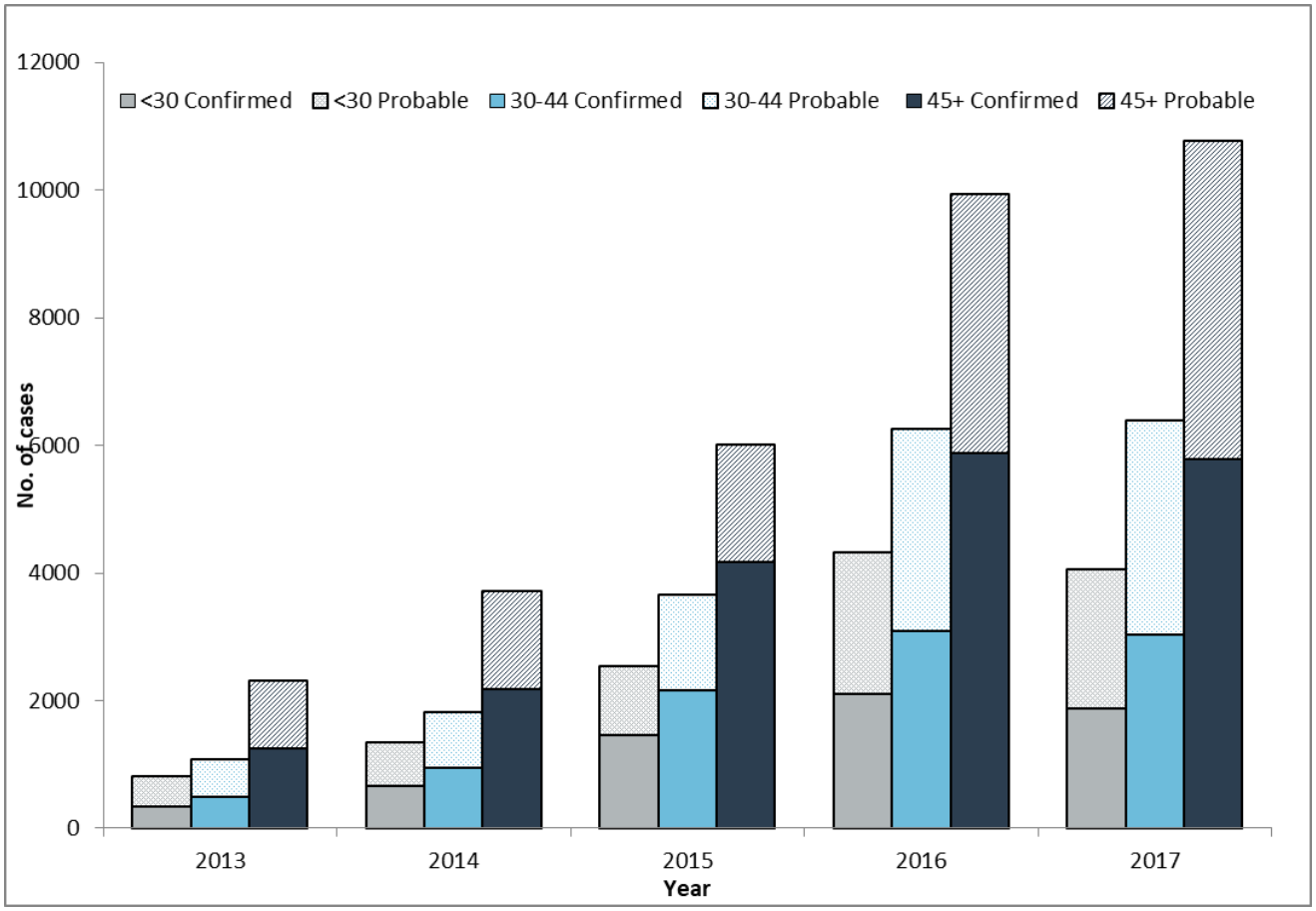


Table 15 - Case Counts and Rates of Newly Reported Confirmed and Probable Chronic HCV Infection by Age Group, Tennessee, 2013-2017

Age Group (years)	2013		2014		2015		2016		2017	
	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate
Total Cases	4,181	65.3	6,866	106.4	12,213	187.9	20,513	313.3	21,264	316.6
<30	806	31.7	1,340	52.4	2,536	98.7	4,314	166.9	4,059	155.9
30-44	1,063	83.9	1,819	143.6	3,647	288.6	6,244	496.2	6,377	503.2
45+	2,300	85.6	3,704	136.0	6,013	217.3	9,932	353.7	10,771	378.6
Confirmed	2,070	32.3	3,771	58.5	7,782	119.7	11,063	169.0	10,709	159.5
<30	330	13.0	657	25.7	1,455	56.6	2,103	81.4	1,869	71.8
30-44	491	38.7	946	74.7	2,153	170.4	3,080	244.7	3,034	239.4
45+	1,244	46.3	2,165	79.5	4,167	150.6	5,870	209.0	5,782	203.2
Probable	2,111	33.0	3,095	48.0	4,431	68.2	9,450	144.3	10,555	157.2
<30	476	18.7	683	26.7	1,081	42.1	2,211	85.5	2,190	84.1
30-44	572	45.1	873	68.9	1,494	118.2	3,164	251.4	3,343	263.8
45+	1,056	39.3	1,539	56.5	1,846	66.7	4,062	144.6	4,989	175.3

From 2013 to 2017, rates of chronic HCV in TN have increased among all age groups. Rates of chronic HCV among the 30-44 year old age group have consistently been highest when compared to the other two age groups.

Figure 25 - Case Counts of Newly Reported Confirmed and Probable Chronic HCV Infection by Age Group and Gender, Tennessee, 2013-2017

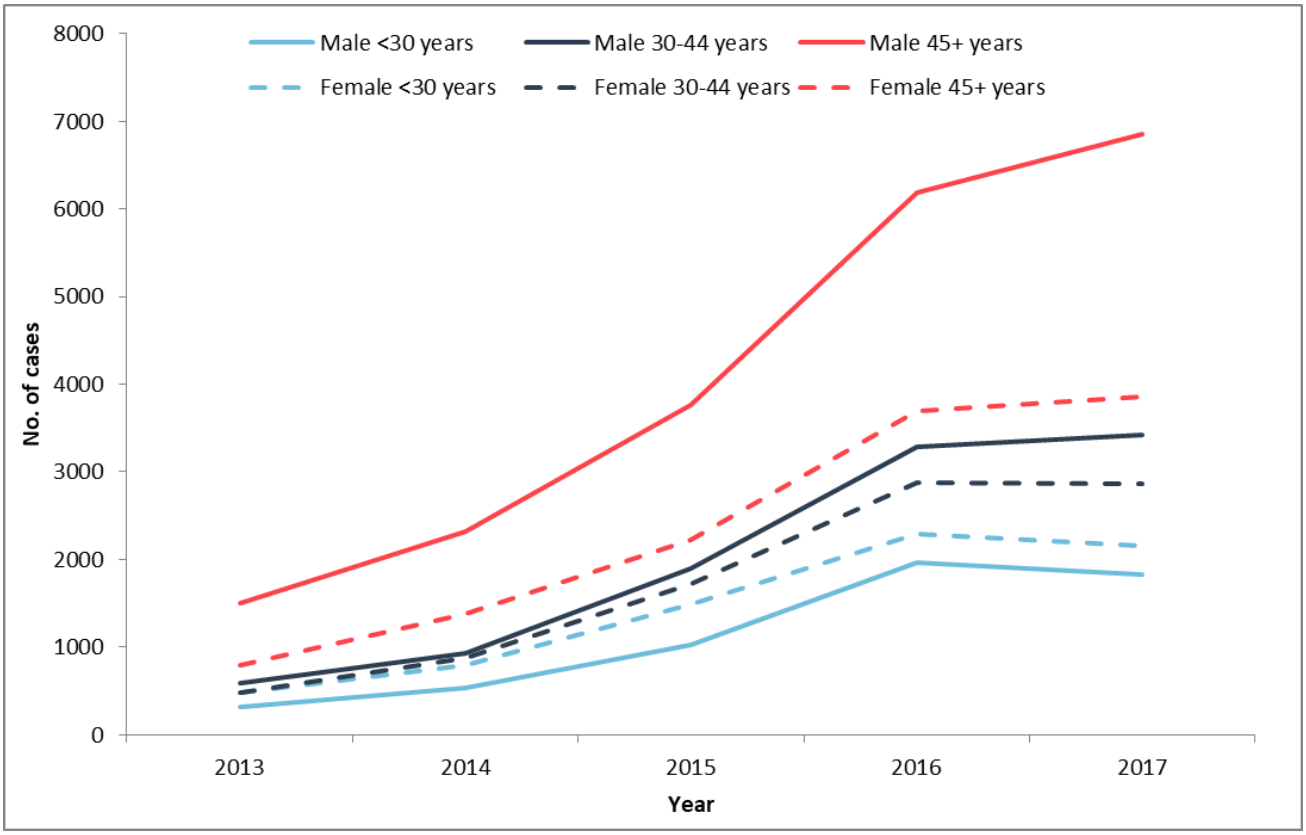


Figure 26 - Rates of Newly Reported Confirmed and Probable Chronic HCV Infection by Age Group and Gender, Tennessee, 2013-2017

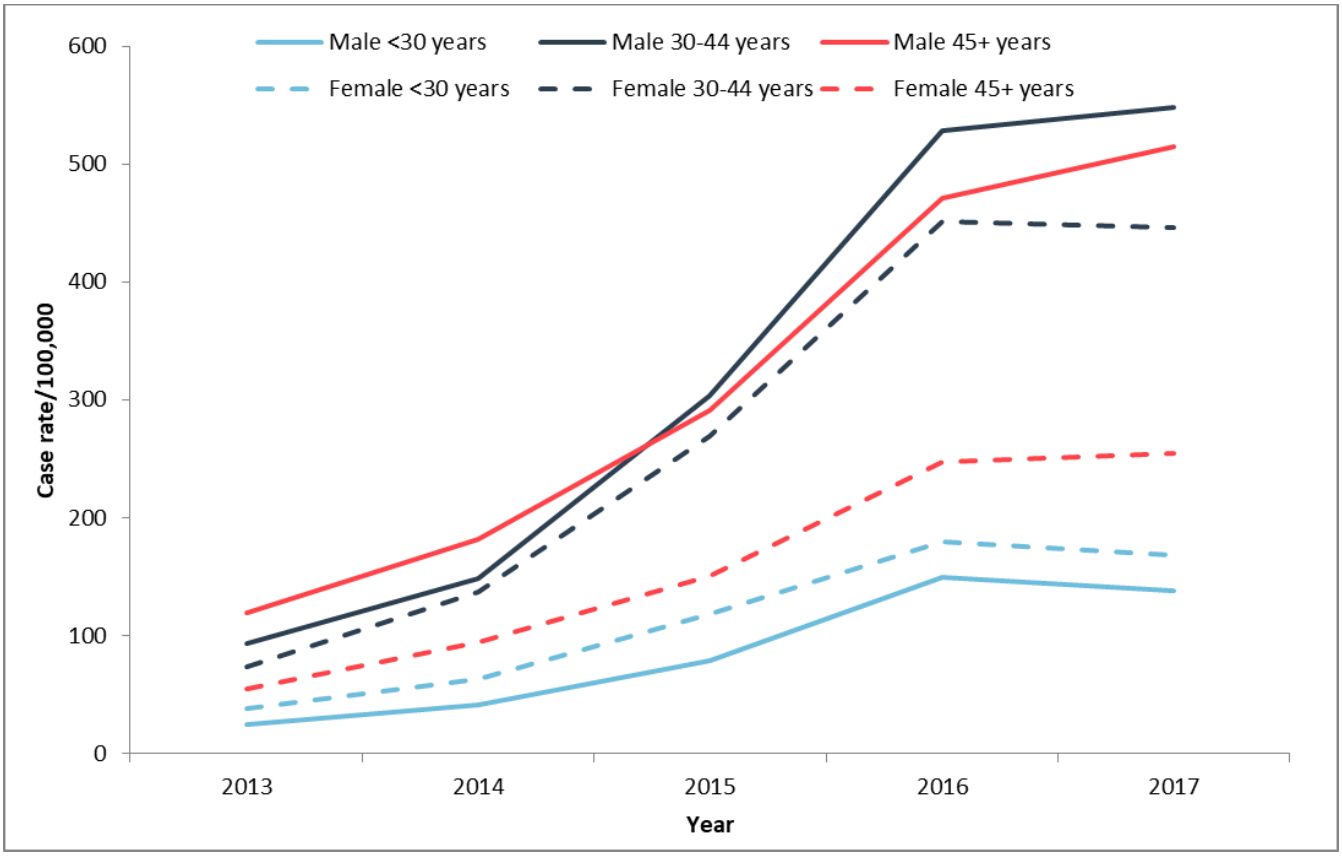
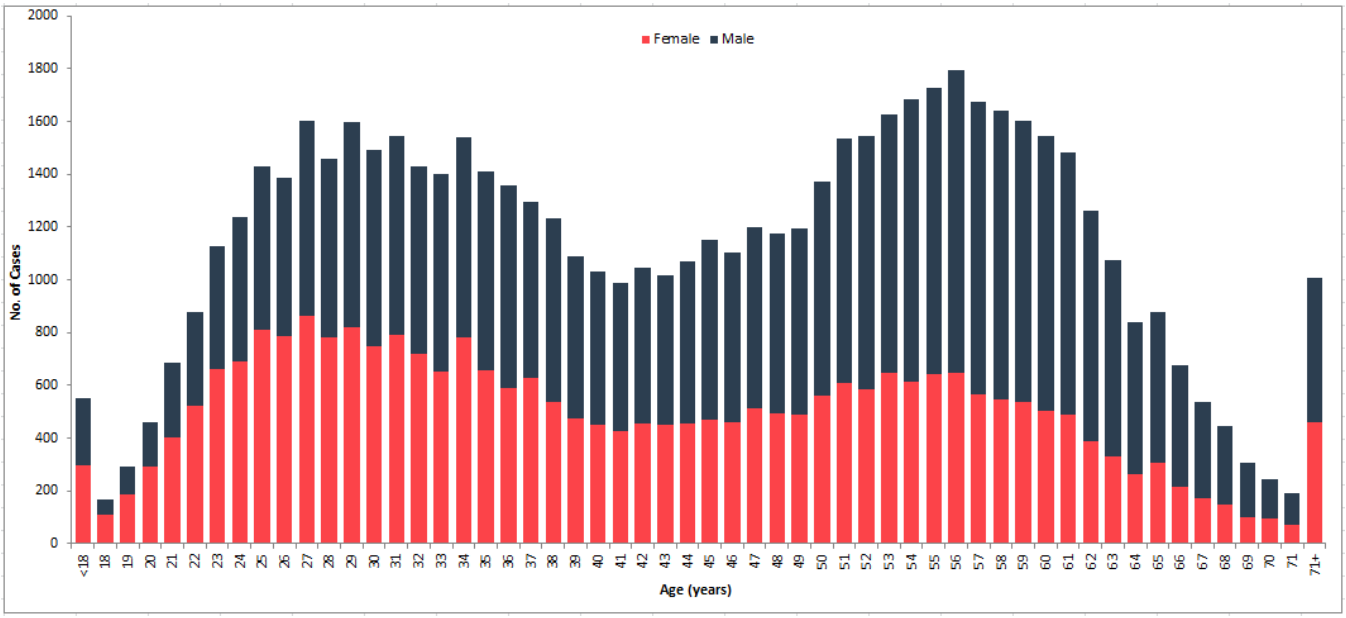


Table 16 - Case Counts and Rates of Newly Reported Confirmed and Probable Chronic HCV Infection by Age Group and Gender, Tennessee, 2013-2017

Age Group (years)	2013		2014		2015		2016		2017	
	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate
Total Cases	4,181	65.3	6,866	106.4	12,213	187.9	20,513	313.3	21,264	316.6
Female	1,751	53.4	3,057	92.4	5,444	163.4	8,880	264.6	8,897	258.6
<30	484	38.6	799	63.3	1,494	117.8	2,295	180.0	2,153	167.9
30-44	474	73.9	881	137.3	1,724	269.2	2,880	451.7	2,866	446.5
45+	790	55.1	1,376	94.8	2,220	150.6	3,694	246.9	3,861	254.7
Male	2,412	77.3	3,777	120.2	6,690	211.2	11,433	358.2	12,131	370.3
<30	319	24.8	534	41.2	1,025	78.7	1,959	149.6	1,830	138.5
30-44	586	93.6	928	148.4	1,893	303.8	3,282	528.6	3,426	547.9
45+	1,498	119.6	2,314	182.1	3,763	291.2	6,180	471.1	6,847	515.0

Figure 27 - Case Counts of Newly Reported Confirmed and Probable Chronic HCV Infection by Age and Gender, Tennessee, 2013-2017



From 2013 to 2017, rates of chronic HCV in TN have increased among all age groups and genders. The highest rates of chronic HCV have been among males 30 years of age and older. Though the overall rate of chronic HCV is higher among men than women, women less than 30 years of age have a higher rate of chronic HCV than men in the same age group.

From 2013 to 2017, case counts of chronic HCV show there is a clear bimodal distribution; the first mode among individuals less than 30 years of age and the second mode among baby boomers.

Figure 28 - Case Counts of Newly Reported Confirmed and Probable Chronic HCV Infection by Race/Ethnicity, Tennessee, 2013-2017

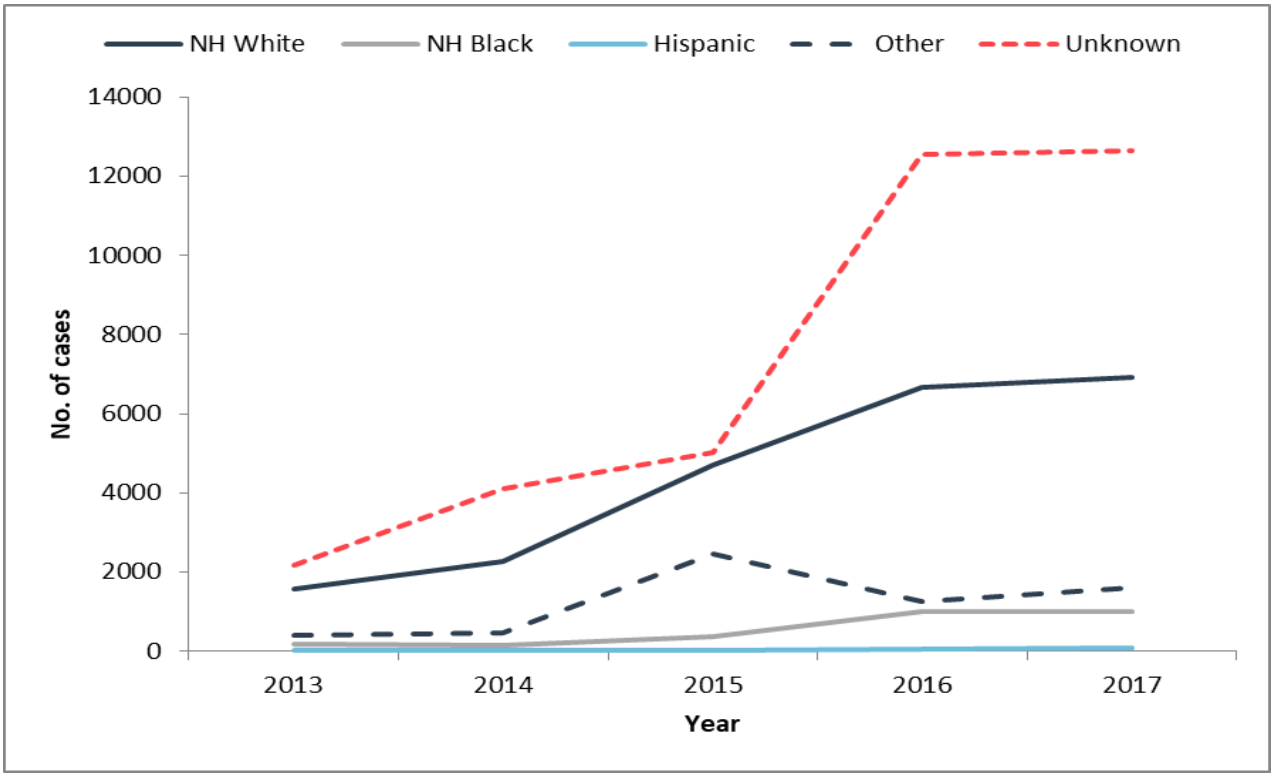


Figure 29 - Rates of Newly Reported Confirmed and Probable Chronic HCV Infection by Race/Ethnicity, Tennessee, 2013-2017

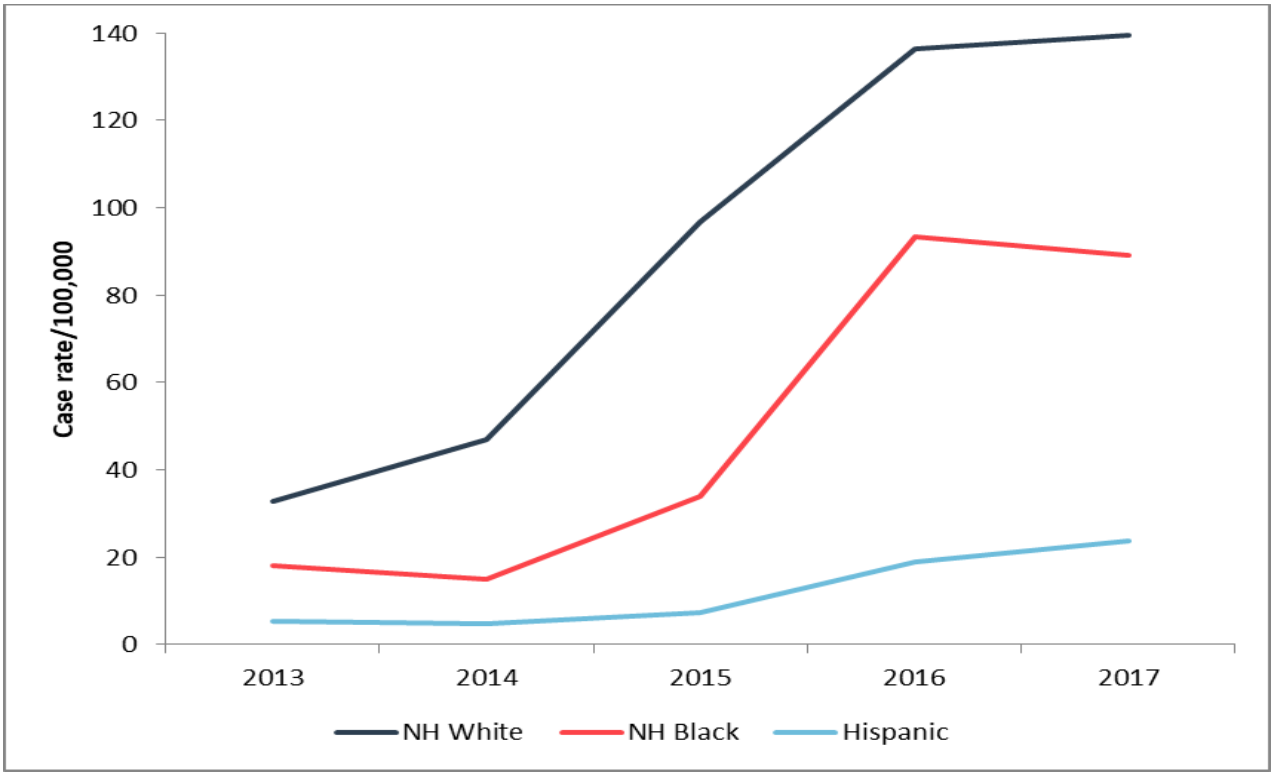


Table 17 - Case Counts and Rates of Newly Reported Confirmed and Probable Chronic HCV Infection by Race/Ethnicity, Tennessee, 2013-2017

Race/Ethnicity	2013		2014		2015		2016		2017	
	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate	Cases	Rate
Total Cases	4,181	65.3	6,866	106.4	12,213	187.9	20,513	313.3	21,264	316.6
NH White	1,580	32.8	2,272	47.0	4,703	96.8	6,660	136.5	6,927	139.6
NH Black	193	18.1	162	15.1	367	33.9	1,019	93.3	1,005	89.2
Hispanic	16	5.3	15	4.8	23	7.2	62	18.9	87	23.7
Other	413	191.2	482	211.5	2,467	1,032.1	1,252	503.8	1,613	622.9
Unknown	2,172	-	4,097	-	5,020	-	12,539	-	12,637	-

The large majority of cases in each year occurred among non-Hispanic Whites, followed by other racial groups, non-Hispanic Blacks, and those with a Hispanic ethnicity.

Glossary

Acute Viral Hepatitis: The early stage of viral infection of the liver caused by one of three different hepatitis viruses (A, B, or C). Signs and symptoms of early (or acute) viral hepatitis include yellowing of the skin or eyes (jaundice), abdominal pain, vomiting, nausea, diarrhea, malaise, grey-colored stools, or dark urine. For Hepatitis B and C, acute infection can lead to chronic infection.

Chronic Viral Hepatitis: A long-term illness that occurs when Hepatitis B or Hepatitis C remains in a person's body. Chronic hepatitis can last a lifetime and lead to serious liver problems, including cirrhosis (scarring of the liver) or liver cancer.

Hepatitis B core antibody total (anti-HBc): The total anti-HBc appears at the onset of symptoms in acute hepatitis B and persists for life. It indicates previous or ongoing infection with hepatitis B virus in an undefined time frame.

Hepatitis B core IgM antibody (IgM anti-HBc): Positivity indicates recent infection with hepatitis B virus (≤6 months).

Hepatitis B surface antibody (anti-HBs): The presence of anti-HBs is generally interpreted as indicating recovery and immunity from hepatitis B virus infection, either naturally or through vaccination.

Hepatitis B surface antigen (HBsAg): A protein on the surface of hepatitis B virus; it can be detected in high levels in serum during acute or chronic hepatitis B virus infection. The presence of HBsAg indicates that the person is infectious.

Hepatitis B Virus (HBV): A double-stranded deoxyribonucleic acid (DNA) virus in the family Hepadnaviridae and genus *Orthohepadnavirus*. It is vaccine preventable.

Hepatitis C antibody (anti-HCV): The presence of antibodies to hepatitis C virus in the blood. It indicates previous or ongoing infection with hepatitis C virus.

Hepatitis C Virus (HCV): An enveloped, single-stranded ribonucleic acid (RNA) virus in the family Flaviviridae and genus *Hepacivirus*. It is not vaccine preventable.

Nucleic Acid Test (NAT)/Nucleic Acid Amplification Test (NAAT): A molecular technique that tests for the presence of a virus or bacterium by testing for the presence of viral DNA (for HBV)/viral RNA (for HCV). NAT testing can be quantitative or qualitative and includes polymerase chain reaction (PCR) and genotype tests. For example, in an NBS Hepatitis C investigation, if you receive a positive result for an RNA, PCR, or genotype test, you will mark 'positive' for HCV RNA result.

Probable Acute Hepatitis B infection (TDH definition): 1) signs or symptoms (jaundice or ALT >100) of HBV, positive HBsAg, and unknown IgM anti-HBc; **OR** 2) in the absence of both signs and symptoms of HBV, HBsAg positive and positive IgM anti-HBc.

Sustained Virologic Response (SVR): With successful HCV treatment, the virus will become undetectable in the blood. Patients are considered cured of HCV when the virus remains undetectable in their blood for 12 weeks after the completion of their treatment, which is also known as a sustained virologic response.

Vertical Transmission (Perinatal Transmission): A pathogen transmitted from mother to baby in pregnancy or during childbirth.

Window Period: The period of time after a person is infected with a communicable disease but before antibodies to the infection is detectable on testing. During the window period, a patient's antibody test will be negative despite the fact that the patient is infected.

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